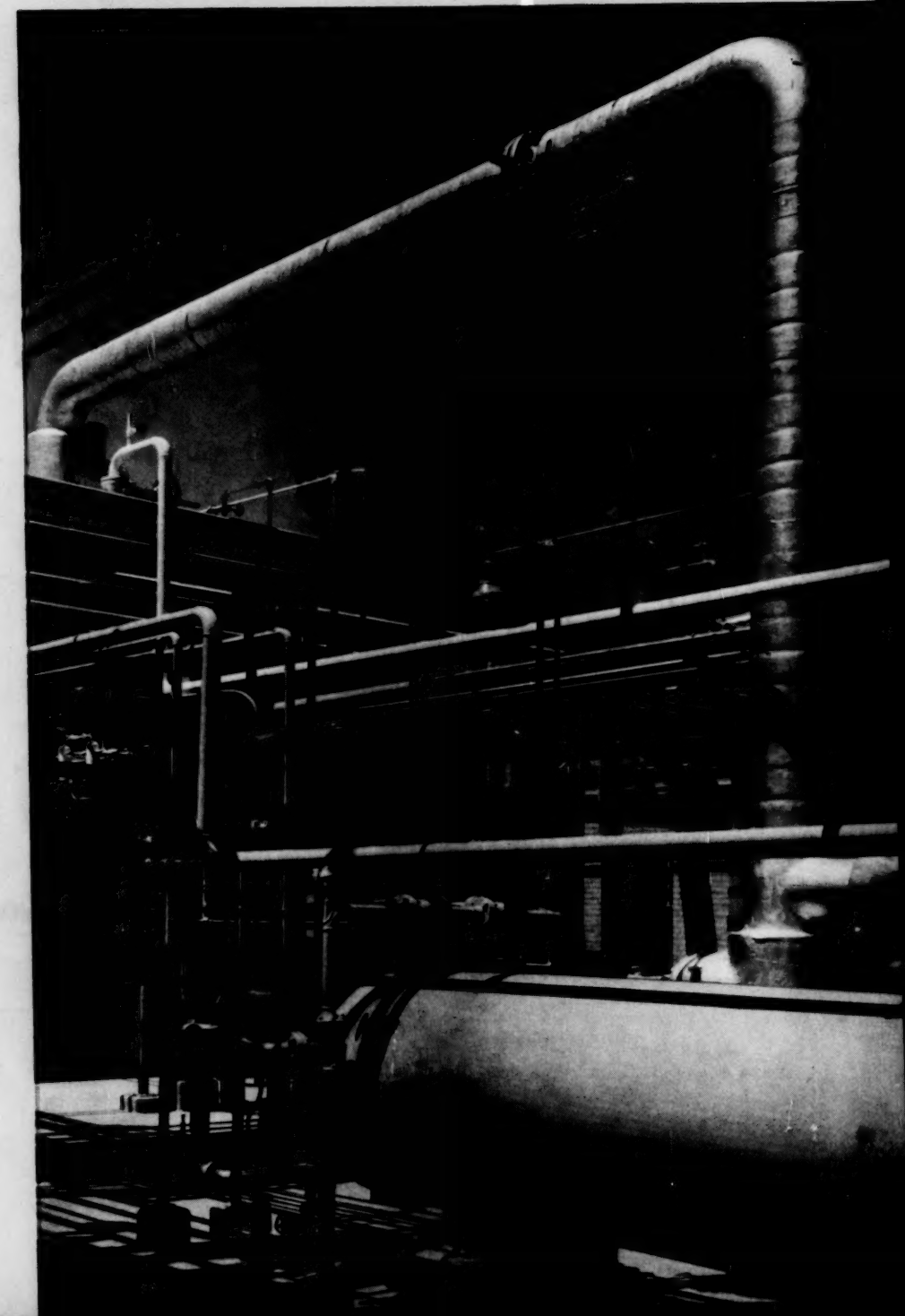
AIR CONDITIONING HEATING AND VENTILATING

DECEMBER 1959

For the Engineer
Engaged in DESIGN
APPLICATION
ESTIMATING
SPECIFICATION
and LAYOUT

Part of the vast amount of piping required at some types of chemical plants. Photo, courtesy of Shell Chemical Corp., is a view of an ethyl alcohol plant.



IN THIS ISSUE

Three-Way Valves—How and Where to Use Them 56

Fan Coil Units Applied in Hydronic Heating - Cooling Systems 67

Automatic Air Conditioning for Bakeries 51

Suction Line Hookups for Parallel Compressors .. 64

Data Sheet — Guide for Rapid Estimating 81

Detail Sheet—Wiring Diagrams for Refrigeration 83

ARI Exposition, Papers, Aims, Interviews 59

Let's Stop the Practice of Free Engineering 85

New Equipment 97

New Literature 90

Ad-Digest 145

FOR OVER

82

YEARS

engineers and research specialists at Watts Regulator Company have directed their knowledge and applied their skills to the regulation of pressure (Water, Steam, Air). Watts has been an outstanding producer of PRESSURE REGULATORS and PLUMBING and HEATING SAFETY VALVES and CONTROLS — a dependable source of finest quality products.

For full data on Watts products (the world's largest line of Plumbing and Heating Specialties) we invite correspondence.

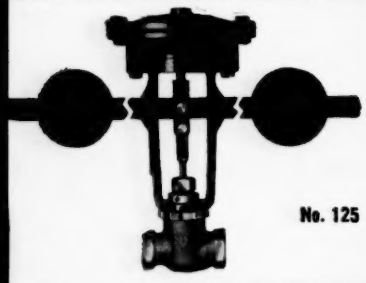
PRESSURE REGULATORS for Commercial, Industrial, Institutional application . . .

STEAM & AIR SERVICE

No. 127

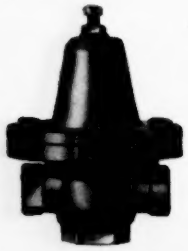
WATTS Nos. 127 and 125 Single Seated Pressure Regulators, Sizes ½" to 4" Initial Pressures up to 250 lbs.

No. 127 spring type — Reduced pressure range 10 to 100 lbs.



No. 125

No. 125 weight and lever type — Reduced pressure range 1 to 15 lbs.



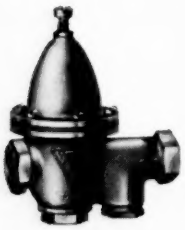
No. 152

WATTS No. 152 Self-Contained Single Seated Pressure Regulator, Sizes ½", ¾", 1".

Iron body construction with bronze trim for initial pressures up to 150 lbs. Reduced pressure ranges 5-40, 25-100 lbs.

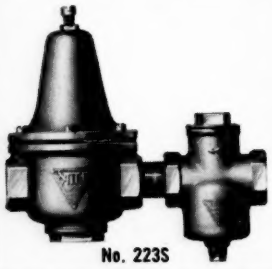
Bronze body construction for initial pressures up to 250 lbs. and reduced pressures up to 200 lbs.

WATER SERVICE



No. 135

WATTS No. 135 Self-Contained Reducing Valve. All bronze unit incorporating integral strainer. Sizes ½" to 2". Initial pressures up to 250 lbs. Reduced pressure range 30 to 75 lbs.



No. 223S

WATTS No. 223 High Capacity Self-Contained Reducing Valve. Sizes ½" to 2". Also furnished with separate strainer, specify No. 223S. Initial pressures up to 250 lbs. Reduced pressure range 30 to 75 lbs.

No. 127W

WATTS No. 127W Remote Control Diaphragm Spring Type Pressure Reducing Valve, Sizes ½" to 3". Initial pressures up to 250 lbs. Reduced pressure ranges available from 10 lbs. to 100 lbs.

WATTS

WATTS REGULATOR COMPANY Lawrence, Massachusetts, U.S.A.

Send for Folder F-135A (Regulators for Water Service)

Folder F-127B (Regulators for Steam and Air Service)

Some Straight Talk On Steam Trap Capacity

...or pulling away the curtain of confusion that surrounds steam trap capacity ratings.

Unfortunately, for the steam trap buyer, the subject of steam trap capacity has become cloudy and confused by a landslide of claims, counter-claims and inconsistent "standards" for measurement. So let's take a cold hard look at this subject so vital to the efficient operation of your plant.

What Determines Steam Trap Capacity?

There are three factors that determine the capacity of a steam trap:

1. The area of the orifice.
2. The density of the condensate.
3. The pressure differential across the trap.

Let's take a closer look at each of these:

Area of orifice is usually specified by the trap manufacturer or can be calculated from the diameter. Nothing complicated here.

Density of condensate depends on temperature. A cubic foot of cold water weighs 62.4 lbs. At 250° F. or 15 psi, it weighs less than 59 lbs. This is important. Don't overlook it.

Pressure differential across the trap is most significant. And it is complicated by the many factors that affect it, such as:

1. Pressure drop between unit drained and the trap when the trap valve is open.

2. Distance the trap valve is moved from the valve seat.

3. Back pressure on the trap with orifice closed; i.e., return header pressure.

4. Increase in back pressure produced by condensate and flash steam flowing in the discharge line. This in turn is affected by the diameter and length of the discharge line, plus friction caused by valves and fittings.

Orifice Capacity Vs. Steam Trap Capacity

Figure 1 shows a ½" diameter sharp-edged orifice at the end of a pipe filled with cold water at 15 lbs. pressure. The capacity of this orifice, using a .61 coefficient of flow would be 8,800 lbs. per hr. Now, would this ½" orifice if used in a ¾" steam trap installed as shown in Figure 2 provide the trap with a continuous discharge capacity of 8,800 lbs. of hot condensate per hour? The answer is "no". And here are some of the reasons why:

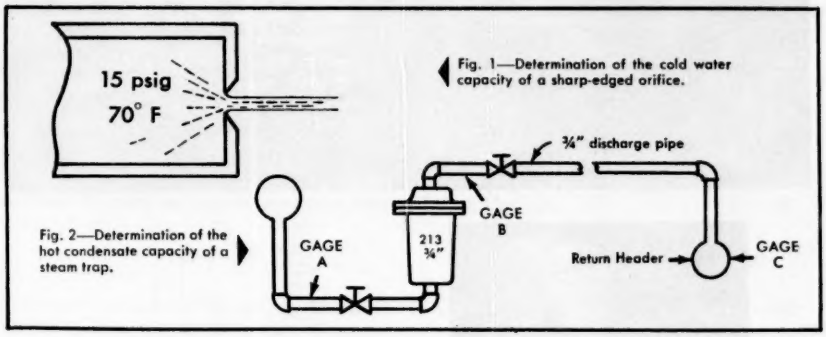


Fig. 1—Determination of the cold water capacity of a sharp-edged orifice.

Fig. 2—Determination of the hot condensate capacity of a steam trap.

Density of condensate. As pointed out above, cold water weighs 62.4 lbs. per cu. ft. At 15 lbs. pressure and 250° F. water weighs less than 59 lbs. per cu. ft. This difference in density alone reduces the lbs. per hour capacity of the orifice by over 5%.

Pressure differential across the trap. With the trap valve closed we have a static pressure differential of 15 psi. The trap valve must be able to open against this pressure. However, this is not the pressure differential that will determine the capacity of the trap valve.

The ¾" discharge line will be full of a mixture of flash steam and condensate. To keep this mixture flowing from the trap outlet to the return line requires a pressure differential. In actual capacity tests run as shown in Figure 2 Gage B at the trap outlet registered 11 lbs. back pressure. Thus the true pressure differential across the trap was about 4 lbs. Under these conditions the measured capacity of the trap was 4,340 lbs/hr. or just about half of the capacity of the ½" orifice for cold water.

How Armstrong Determines Capacity Ratings

Armstrong trap capacity ratings are based on hundreds of tests under actual operating conditions. In these tests, the condensate used was at the steam temperature corresponding to the test pressure. Thus, the capacities determined take into account the pressure drop that occurs when the trap orifice opens and the choking effect and back pressure of the flash steam. Actual installation hook-ups were used so that pipe friction in both inlet and discharge lines as well was reflected in the results.

Let's go back to the example cited above and in Figure 2. The trap referred to is an Armstrong No. 213. While it did test out at 4,340 lbs. per hour for a static pressure differential of 15 psi, it is rated in the catalog at only 3900 lbs. per hour for this pressure—just to be on the safe side.

For the trap buyer, this means that Armstrong Steam Trap capacities are based on handling condensate at steam temperature for the stated static steam pressure differential under actual working conditions.

Capacity ratings which don't take into account all of the variables will be misleading and may lead to the selection of undersized traps. So whenever you specify or buy traps be sure that the capacity ratings you work from are realistic. One way to be sure is to select Armstrong Traps with *guaranteed* capacity ratings.

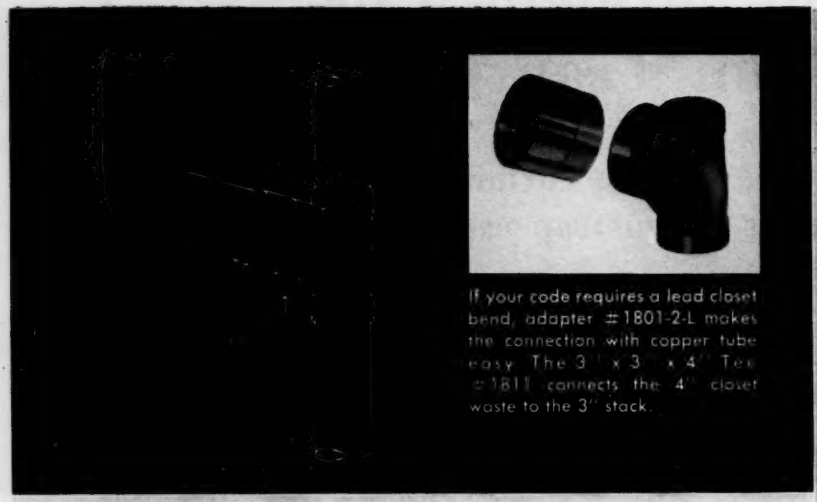
* * *

Additional information on trap capacity ratings, plus data on how to correctly size, install and maintain steam traps for any pressure, any temperature and any load, are presented in the 48-page Armstrong Steam Trap Book. Ask your local Armstrong Representative for a copy or write:

Armstrong Machine Works
8466 Maple Street
Three Rivers, Michigan

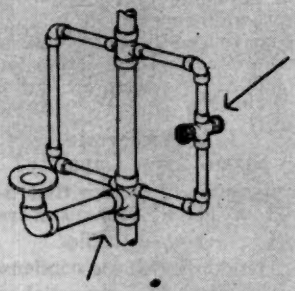
ARMSTRONG STEAM TRAPS

"See our Catalog in Sweet's Industrial Construction File"



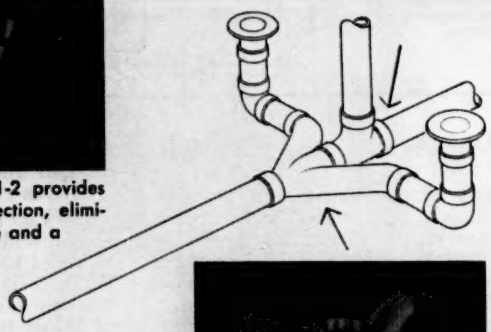
If your code requires a lead closet bend, adapter #1801-2-L makes the connection with copper tube easy. The 3" x 3" x 4" Tee #1811 connects the 4" closet waste to the 3" stack.

For back-to-back waste lines, fitting #1835-3-3 lets you install threaded nipples prior to plastering.



Here's new time-saver—required by some codes — #1870. Note center line of side inlets is above center line of the main 3" inlet.

Sanitary Tee #1811-2 provides fitting-to-fitting connection, eliminating a short nipple and a soldering operation.



Double long turn T-Y #1836 eliminates the double Y-branch and 45° elbows combination.

A FEW TYPICAL EXAMPLES OF TIME-SAVING ANACONDA FITTINGS

THERE IS A "RIGHT" ANACONDA FITTING FOR EVERY CONNECTION. With solder-joint fittings, a copper tube drainage system is roughed in quickly and easily—even when the work is overhead or in tight quarters. And there are many Anaconda fittings that save you still more time, effort and cost because they eliminate the need to assemble several fittings or a combination of fittings and short nipples. Do you have our *Catalog C-12* "Anaconda Copper Tube Fittings and Valves"? Every size (from 3/16" through 12") and type you need for general plumbing, heating, air-conditioning and refrigeration is listed for ready reference and ordering. Write: The American Brass Co., Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

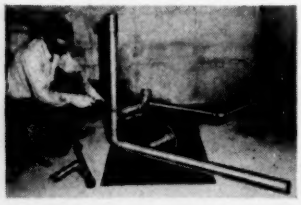
5909

ANACONDA® **COPPER TUBE AND FITTINGS for soil, waste and vent lines**

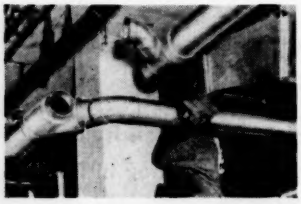
Available through plumbing wholesalers. Products of The American Brass Company

Longer Lengths—Fewer Joints

Preassembly—Saves Time



Lightweight Copper—Easier Installation



Compact Connections—Save Space

AIR CONDITIONING HEATING AND VENTILATING

Volume 56, Number 12 December, 1959

EDITORIAL STAFF

EDITOR
Clifford Strock

ASSOCIATE EDITORS
Nathan N. Wolpert
William B. Foxhall
Harold M. Englund
Richard L. Koral

ADVERTISING REPRESENTATIVES

NEW YORK
Harry J. Twine
R. E. McLoughlin
93 Worth Street
CAnal 6-8120

CLEVELAND
Edward B. McEntee
17115 Hillaboro Rd.
IVanhoe 1-6857

CHICAGO
George G. Turner
Peter B. Impasto
228 N. LaSalle St.
FInancial 6-6864

BIRMINGHAM
Fred W. Smith
1201 Forest View Lane
TRemont 1-5762

DALLAS
Richard B. Hoierman
9006 Capri Drive
DAvis 7-3630

LOS ANGELES
Whaley Simpson Co.
6608 Selma Ave.

SAN FRANCISCO
Whaley Simpson Co.
700 Montgomery Bldg.

EXECUTIVE OFFICERS

PRESIDENT
Robert B. Luchars

VICE PRESIDENT-TREASURER
Edgar A. Becker

SECRETARY-PUBLISHING MGR.
Harold L. Gray

AIR CONDITIONING, HEATING AND VENTILATING is published monthly by The Industrial Press, 93 Worth Street, New York 13, N. Y. Executive, editorial and subscription offices, 93 Worth Street, New York 13, N. Y. • Entered as second-class matter August 31, 1956 at the Post Office, East Stroudsburg, Pa., under Act of March 3, 1879. • Subscription rates: In the United States and Canada, one year, $3; two years, $5; three years, $6; in Mexico, Central America and South America, one year, $4; two years, $7; three years, $8; in all other countries, one year, $7; two years, $12; three years, $14. Single copies, 50c. • Copyright 1959, by The Industrial Press. Permission required to reproduce articles. • Contents of AIR CONDITIONING, HEATING AND VENTILATING are indexed monthly by Industrial Arts Index and microfilmed by University Microfilms, Ann Arbor, Mich. • Member: National Business Publications, Business Publications Audit of Circulation, Inc., Society of Business Magazine Editors.

AIR CONDITIONING

Automating a Modern Bakery 51
Required air conditioning and refrigeration design conditions..G. G. Swanson

PIPING

Common Errors in Application of Three-Way Valves 56
Correct hook-ups, sizing, and selection discussed.....S. Daryanani

ARI EXPOSITION

Air Conditioning of Shopping Centers 59
Central air conditioning vs. individual option.....H. Guttman

Where and How DoD Uses Air Conditioning 60
Government calls for manufacturer-engineer cooperation....T. R. Casberg

ARI Strives for Honest Ratings 61
Operation, aims, and future plans of ARI—Interview feature.

Reactions to the Show 63
Comments from visiting engineers and contractors.

REFRIGERATION

Suction Line Piping to Parallel Compressors 64
An analysis of poor and good hookups.....J. R. Harnish

BOILERS

Priming and Foaming in Low Pressure Heating Boilers 66
Discusses causes, means of prevention and cure.

HEATING-COOLING

Reference Section—Fan Coil Units and Systems 67
Equipment available and how it should be applied.....W. H. Divine

AIR CONDITIONING AND REFRIGERATION

Data Sheet—Estimating Guide for Specific Applications 81
Engineering and pricing data for quick estimations.

REFRIGERATION

Detail Sheet—Wiring Diagrams for Refrigeration Compressors ... 83
Evaporative condenser or cooling towers, single or duplex compressors.

ENGINEERING

Consulting Engineers Urge End of Free Engineering 85
Discussions at CEC meeting.

DEPARTMENTS

High Spots in the News 4
Washington Overtones—L. Overman 6
News of the Month 10
Scientific Frontiers 14
Piping and Plumbing—L. Blendermann 86
New Literature 90
Product Applications 93
Degree-Days for October, 1959 95
New Equipment and Materials 97
Briefly Stated News Items .. 124
What Readers Say 136
Coming Events 138
Canadian Degree-Days for October, 1959 140
Index to Advertisers 142
Ad-Digest 145

HIGH SPOTS

The January issue of ACH&V will contain a report of the Fall Conferences of Building Research Institute, recently concluded at the Shoreham Hotel in Washington, D.C. There were three full days of presentations of papers and discussion of problems common to architects, engineers, owners, and others in the building industry. We will present in as succinct a form as possible those portions of the proceedings that were of value of our readers in advance of the complete proceedings, which BRI will publish in several booklets in the coming months.

This issue contains a comprehensive report from Atlantic City on the ARI Exposition and Conference. Included is an exclusive interview with George S. Jones, ARI managing director, who explains what ARI is trying to do and where it plans to go. As a special feature of the report, a full page is devoted to interviews with engineers and contractors who stopped at the ACH&V booth and gave us their impressions of the Exposition.

The series of Reference Data Sheets on pricing and engineering estimating data for air conditioning and refrigeration continues this month with the first of a series of four data sheets containing data on specific types of installations: stores, dairies, food lockers, offices, and dozens of others.

The 9th Annual Industrial Ventilation Conference, co-sponsored by the Division of Occupational Health of the Michigan Department of Health, and the College of Engineering, Michigan State University, will be held February 15-18, 1960, at the Kellogg Center for Continuing Education, Michigan State University, East Lansing, Michigan.

It will consist of practical lectures and demonstrations, plus informative classroom design sections to provide up-to-date factual data and know-how on fans, hood design, make-up and system performance. Separate staffs of qualified practicing engineers will lead the workshop sessions in both industrial and mining ventilation design problems. The conference is open to engineers and contractors as well as all others concerned with good, practical ventilation. For information, write The Kellogg Center for Continuing Education.

Exhibits at the 2nd Southwest Heating & Air-Conditioning Exposition will feature adaptability of equipment to climate, that is, ability to balance out effects of unpleasant weather in any climate by the simplest adaptations of their basic designs.

Above normal temperatures are characteristic of the southwestern climate and the Exposition will present new adaptations of evaporative cooling. By contrast, sudden dips into the lows produce a sharply defined, intermittent heating problem, and the year-round air-conditioning system, as typified by the heat pump, will be a significant feature of the display, as will many supplementary heating units.

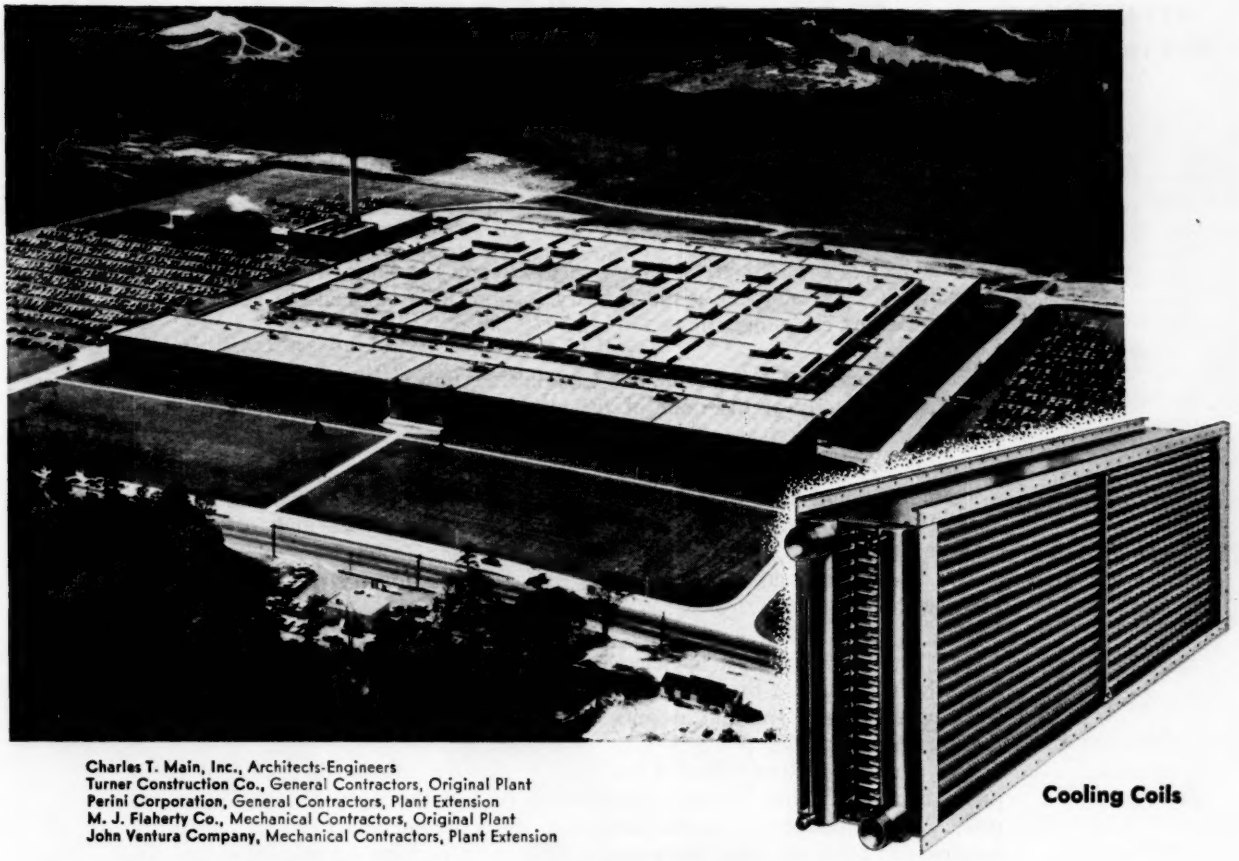
The Exposition will be held at the Dallas Memorial Auditorium, February 1 to 4, 1960, under the auspices of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, in conjunction with its meeting there.

The eighth annual Golf Outing sponsored by Coyne & Delany for its architect, engineer, wholesaler, and contractor friends broke all attendance records. Over three hundred joined company representatives for dinner at Winged Foot Country Club in Mamaroneck, N. Y. and over two hundred of these had met earlier on the club's famous golf links. Bob Duklauer, of the plumbing firm, Eugene Duklauer, Inc., walked off with the trophy this year with a low score of 76.

Western Electric Company

NEW MERRIMACK VALLEY WORKS

32 Acres of Floor Space



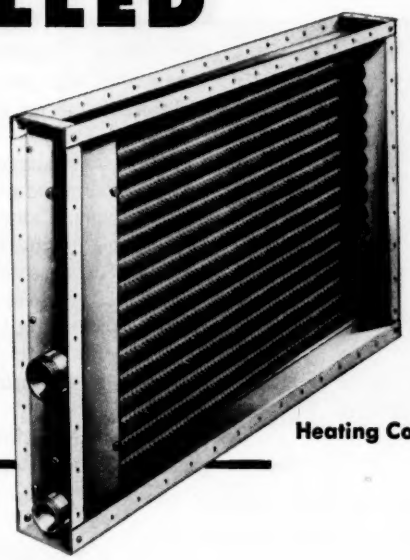
Charles T. Main, Inc., Architects-Engineers
Turner Construction Co., General Contractors, Original Plant
Perini Corporation, General Contractors, Plant Extension
M. J. Flaherty Co., Mechanical Contractors, Original Plant
John Ventura Company, Mechanical Contractors, Plant Extension

Cooling Coils

AEROFIN INSTALLED

Modern smooth-fin design of Aerofin coils permits ample heat-exchange capacity in limited space — permits the use of high air velocities without turbulence or excessive resistance.

Aerofin performance data are laboratory and field proved. You can safely specify Aerofin coils at full published ratings.



Heating Coils

AEROFIN CORPORATION

101 Greenway Ave., Syracuse 3, N. Y.

Aerofin is sold only by manufacturers of fan system apparatus. List on request.

ENGINEERING OFFICES IN PRINCIPAL CITIES

WASHINGTON OVERTONES

by LORING F. OVERMAN

● Over and above the tragicomic echoes of the Congressional TV Quiz Show quiz, principal Washington overtone of the month is inflation.

Steel is the villain in this instance, with the long steel strike focussing attention upon the effects of an unending spiral of wage-price increases, and the lack of legislation capable of arresting the spiral in time to keep the economy and the business community from being badly hurt.

Among the overtones:

Some members of Congress, among them Oregon's Senator Morse, are readying legislation for introduction at the January session, to strengthen the government's hand in halting crippling strikes.

The Congressional Joint Economic Committee, studying the inflation spiral, lays the blame squarely at the door of the steel industry—management, labor, consumers. Its conclusions:

(a) If steel prices had behaved like other industrial prices, the total wholesale price index would have risen by 40% less over the last decade, and less by 52% since 1953. Finished goods prices would have risen less by 23 and 38% respectively.

(b) The increase in steel prices is due to the extraordinary rise in wages combined with only an average rate of increase in productivity, and to the increase in profits, in taxes, and in depreciation charges.

(c) Neither the increase in steel wages nor the increase in steel prices can satisfactorily be explained by demand factors alone. The wage and price behavior of steel represents an important instance of inflation caused to a substantial degree by the exercise of market power.

(d) The rise in steel prices is a critical part of the inflation in industrial goods prices in recent years. It is not more than a part of the story of inflation in this period, other important elements being the run-up in machinery prices, the rise of construction costs, the increase in service costs, and, perhaps equally important, the failure of prices in other fields to fall.

(e) In the coming years the nature of the inflationary hazards facing the economy will continue to change as they have in the past. Continual economic analysis and a wide range of flexible policies, suited to the specifics of the changing process which determines the path of the price level, are necessary if price stability is to be promoted without affecting the growth of the economy adversely.

In line with suggestions of the Joint Economic Committee, although independent of its recommendations, are other overtones seeking a solution of the problem:

A Citizens Campaign seeking 15 million individual "anti-inflation" pledges got under way during November, with commendatory addresses by President Eisenhower, Vice President Nixon and Senator A. Willis Robertson (D-Va.)

The pledge covers three points:

(a) Opposition to inflationary government programs, local, state or national.

(b) A promise to "buy wisely".

(c) A promise to try to increase personal productivity.

National Association of Manufacturers, in a statement submitted to the Congressional Joint Economic Committee, cited three problems and four goals:

(Continued on page 8)

Remove Condensate and Air without STEAM LOSS with

HOFFMAN STEAM TRAPS

Guardian of your Fuel and Comfort

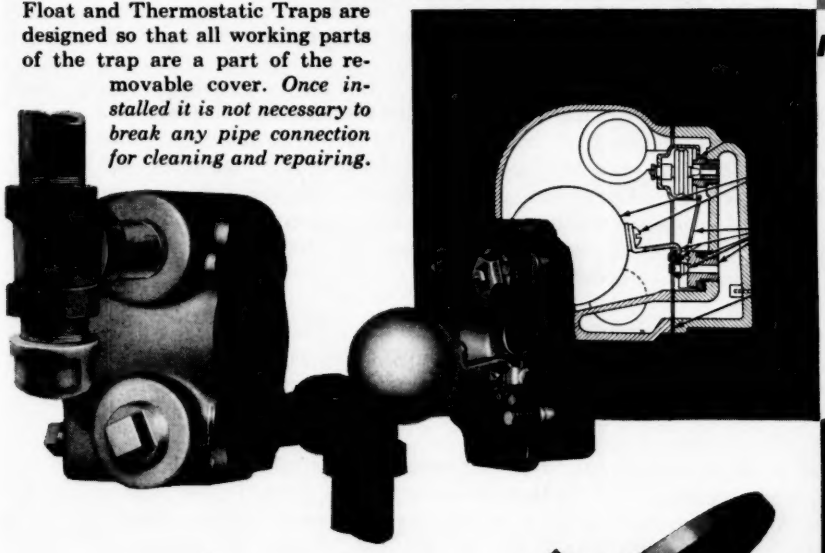
Hoffman Traps incorporate design features which assure both effective *and* economical removal of condensate from steam lines and equipment. Typical of Hoffman's complete line are the Traps illustrated, each with removable cover, pin and seat for quick inspection and cleaning.

LOW, MEDIUM and HIGH PRESSURE THERMOSTATIC TRAPS with RENEWABLE THERMOSTATS and VALVE SEATS

A complete line of Low, Medium and High Pressure Thermostatic Traps for service with radiation, dryers, sterilizers, mangles, cookers and similar uses. *Renewable thermostats and seats are important constructional features contributing to long life and low cost service.* Medium and High Pressure Traps have stainless steel pins and renewable seats.

50 SERIES F & T TRAP

Float and Thermostatic Traps are designed so that all working parts of the trap are a part of the removable cover. *Once installed it is not necessary to break any pipe connection for cleaning and repairing.*



MAINTENANCE COST

1. Complete Thermostat Assembly
2. Durable, accurately machined Valve Lever and Seat Assembly
3. Copper Float Ball Assembly
4. Graphite Impregnated Asbestos Gasket
5. Heavy Duty Cast Iron Cover

600 SERIES INVERTED BUCKET TRAP

Hoffman Bucket Traps operate intermittently and are ideal for draining condensate and air from steam lines or equipment where large quantities of air and condensate must be discharged. *They are easily inspected, cleaned and serviced by merely removing the cover.*

Highly Efficient and Easily Accessible Interior Design

Cover with plug, stainless steel valve seat and holder

Bucket and valve assembly including lever, tantalum pin, valve, stainless steel pin, bucket strap, screw, locknut and washer

Body with gasket and drain plug

HOFFMAN
SPECIALTY MANUFACTURING CORP.
1700 WEST 10th STREET, INDIANAPOLIS 7, INDIANA

Valves, Traps, Vacuum and Condensation Pumps, Forced Hot Water Heating Systems, stocked and sold by leading Wholesalers of Heating and Plumbing Equipment.

For full particulars, write for catalogs on Bucket Traps, Float and Thermostatic Traps or Thermostatic Traps.

WASHINGTON OVERTONES *(Continued from page 6)*

The problems—rising labor costs, shortage of venture capital, and the rapidly increasing competition from other countries for both foreign and domestic markets.

The goals—an adequate rate of growth in our productive potential; substantially full and continuous use of that potential, including the labor force; reasonable stability of prices, and a determined vow by the American people to resist inflation.

The U.S. Chamber of Commerce, recommending a three-fold program of high employment, price stability, and economic growth, presented evidence that the three are not incompatible if carried out with restraint.

It was conceded, however, that economic growth can cause temporary unemployment by introducing technological changes making certain jobs unnecessary. The Chamber contended that such changes spawn other and better jobs, possibly in other communities.

The Chamber proposed to implement its program with a schedule including tax reform, debt limitation, prompt dissemination of information by government agencies, and a flexible monetary policy at the Federal level.

● The National Lumber Manufacturers' Association, meeting mid-month in Washington, was told that by the year 2000, the typical American family will earn $10,000 a year and spend an average of $25,000 for homes. Speaker was Julian H. Zimmerman, head of the Federal Housing Administration.

Zimmerman said that the income jump, accompanied by a doubling of the present 178-million population, would make home construction and furnishing a $335-billion-a-year industry. Such a figure should allow ample margin for air conditioning systems.

● Rural Lines, a publication of the Rural Electrification Administration, points out that some manufacturers of electrical heating apparatus are providing inferior equipment under the financing plan provided by a special section of the REA Act.

Comments the publication: "The electric power suppliers, working with electrical heating equipment and insulation manufacturers, the electrical contractors and the insulation installers, must provide the overall guidance to the electrical heating program if all concerned are to benefit."

● Project Sparks—a program involving radiation hazards to fuel and other volatile materials—is being undertaken by the Bureau of Ships. Other Defense Department studies, with industry assistance, are concerned with possible detonation of ordnance and fuels by radio-frequency energy emitted from radio and radar transmitters.

● New types of building industry statistics, recommended by industry as being of greater service, are being sought by the Bureau of the Census, U. S. Department of Commerce. Among changes, the Bureau is seeking ways to report housing starts in territories where building permit figures are not available. Means of gauging the accuracy of building permit data in other areas is also under study.

Collection of statistics on maintenance, repair and remodeling is also contemplated. The Bureau is accepting as a guide a Users Conference report which assigns first priority to:

(a) Addition of a survey of the characteristics of new housing as a regular feature of the Federal Statistics program.

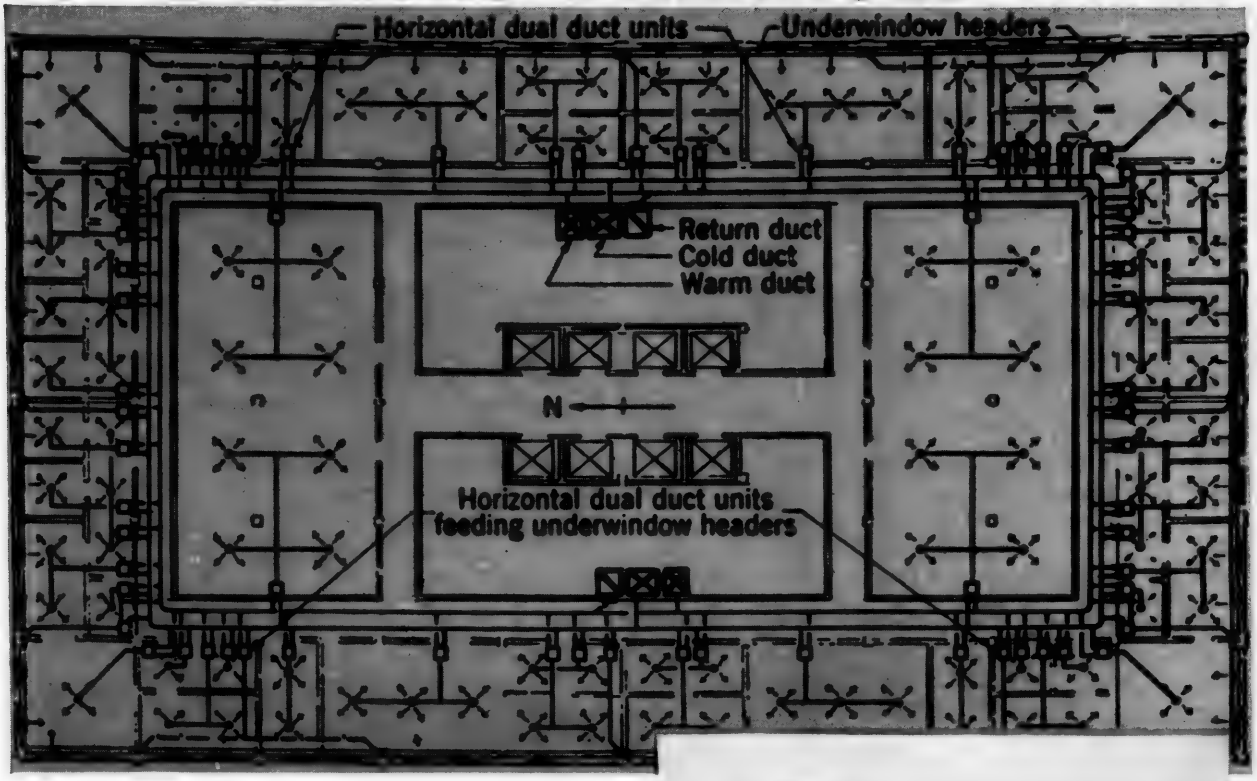
(b) Continuation of efforts to improve estimates of expenditures for maintenance, repairs, additions and alterations.

(c) Improvements in the housing starts series to eliminate, insofar as possible, the inconsistencies between the starts series and the Census of Housing and National Housing Inventory Data.

(d) Continuation of the National Housing Inventory as a regular feature of the Federal statistics program.

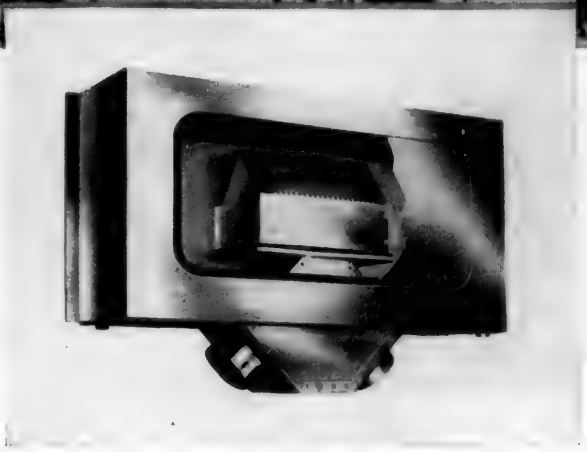
(e) Beginning work leading to the development of an adequate cost of construction index.

DUAL DUCT SYSTEMS BALANCED BY BUENSOD



Shown above is a typical office building Dual Duct layout. It shows a floor plan for known-occupancy requirements in either a new or modernized old building. This economical, 100% all-air system is zoned to provide selective temperature control for each enclosure. Lack of under-window space is overcome by installation of overhead mixing units feeding air to slim distributing headers under the sill of the windows. This takes care of the skin effect of the building.

Illustrated: Buensod Type H unit designed for overhead installation, generally above hung ceilings. The unit may be connected to any standard ceiling diffuser or grille. Cutaway shows self-contained volume regulator in place.



Buensod Dual Duct air mixing units are the flexible, economical answer to your floor-by-floor air distribution problems. The series of Buensod diagram advertisements (of which this one is the third) illustrates this fact. The first advertisement showed a normal, all-air system for a commercial office building. Anticipated changes in space arrangement required much flexibility. The second advertisement presented a structure with the air system supplemented by radiation. In all three layouts the space arrangement and conditioning requirements are identical.

And in this third advertisement, the plan above shows a 100% all-air Dual Duct system for the floor plan where less flexibility—fewer changes in zones—are expected.

Dual Duct versatility is further enhanced by Buensod's *exclusive* pre-balancing of units at the factory. When so ordered, they will immediately deliver the specified air volume upon installation.

BUENSOD dual-duct

BUENSOD-STACEY

Buensod-Stacey, Inc., 45 West 18 Street, New York 11, New York

NEWS OF THE MONTH

ELECTRONIC SEARCHING SERVICE FOR METALS SOCIETY SCANS 100,000 INDEXED DOCUMENTS PER HOUR

An electronic metallurgical searching service with a 100,000 titles-per-hour capacity will be launched early in 1960 by the American Society for Metals, whose headquarters are at Novelty, Ohio, east of Cleveland.

The new facility, to be known as the ASM Metals Documentation Service, will literally save thousands of dollars for those needing specific information on metallurgical problems, said Allan Ray Putnam, ASM managing director. It is an outgrowth of four years of research and pilot plant experience in the field of indexing and machine searching.

The new service was announced at the Society's annual meeting held in Hotel Sherman, Chicago, in conjunction with the 41st National Metal Exposition and Congress.

The searching project will supply subscribers with titles and information about documents reporting on any aspect of metallurgical science, engineering, and the fabrication and use of metal parts that appear in the world's literature.

The pilot program was conducted under ASM sponsorship at the Center for Documentation and Communication Research of Western Reserve University, Cleveland, Ohio. A grant of $75,000 by the Metal Society financed the experimental work.

Start of the searching service on an industry-wide basis awaits delivery by General Electric Company of the first electronic computer-type machine specifically designed for this searching. The unit is expected to be ready early in the new year.

Lightning Speed

When in operation the new searching machine will be able to search 100,000 indexed documents per hour and print out titles and sources of those pertinent to the subscriber's need.

The new ASM documentation service will index facts and names of articles and publications on magnetic tape where it will be ready for searching within one to two weeks after publication for domestic journals and within a month for foreign.

Marjorie Hyslop, Metal Society editor and director of the pilot searching program, pointed out that the purpose of the new service will be to provide a selecting, abstracting, indexing, and searching service that is fast, current, and thorough. It will cover the world's published information on "metals, all their production processes, fabrication methods, properties and applications, equipment and fuels, and refractories where pertinent to metallurgical processes."

Subscribers Invited

The new searching service will invite subscribers giving them the opportunity of specifying exactly the areas in which subject matter is desired, it was announced.

The system is devised so that it can be extended to cover "fringe" areas bearing on metallurgical fields. It is possible, according to Mrs. Hyslop, that the ASM service will eventually include something like 40,000 documents per year instead of the present 12,000 that constitute the metallurgical universe.

The ASM interprets broadly "published" material. Included are the world's technical and scientific periodical literature and books, as well as unclassified government reports, monographs from private sources, and commercial publications.

Ten Years of Study

More than ten years of research have gone into the method of subject analysis for feeding information into the searching machine. As many as 100 indexing terms or "descriptors" can be provided for one document.

Broadly, the GE-250 selector acts as a built-in thesaurus. It groups subjects together that should go together and it shows function in its proper relationship to the information needed.

The searching selector stores information on magnetic tape with search questions stored in the "memory" of the machine. Inquiries, as many as 10, on magnetic tape are fed into the unit simultaneously. Successive reels are searched at the rate of 15,000 characters per second for satisfaction of any or all of the 10 inquiries.

Wide Uses

The new ASM service will be beneficial to concerns isolated from libraries. It will aid research labora-

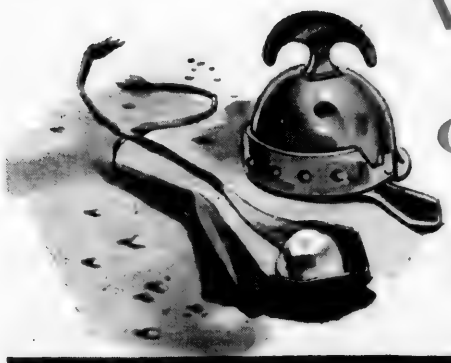
(Continued on page 12)

I-B-R RESEARCH HOUSE TO TEST VALANCE SYSTEM

The Valance heating-cooling system made news at the Semi-Annual Meeting of The Institute of Boiler and Radiator Manufacturers, held November 10-12 at Absecon, N. J. The system was recommended by an I-B-R committee on future systems for inclusion in this coming summer's investigation at the I-B-R research house in Urbana, Ill. Performance data obtained there will be studied along with cost figures as part of the evaluation which will determine whether the system will be recommended to I-B-R members.

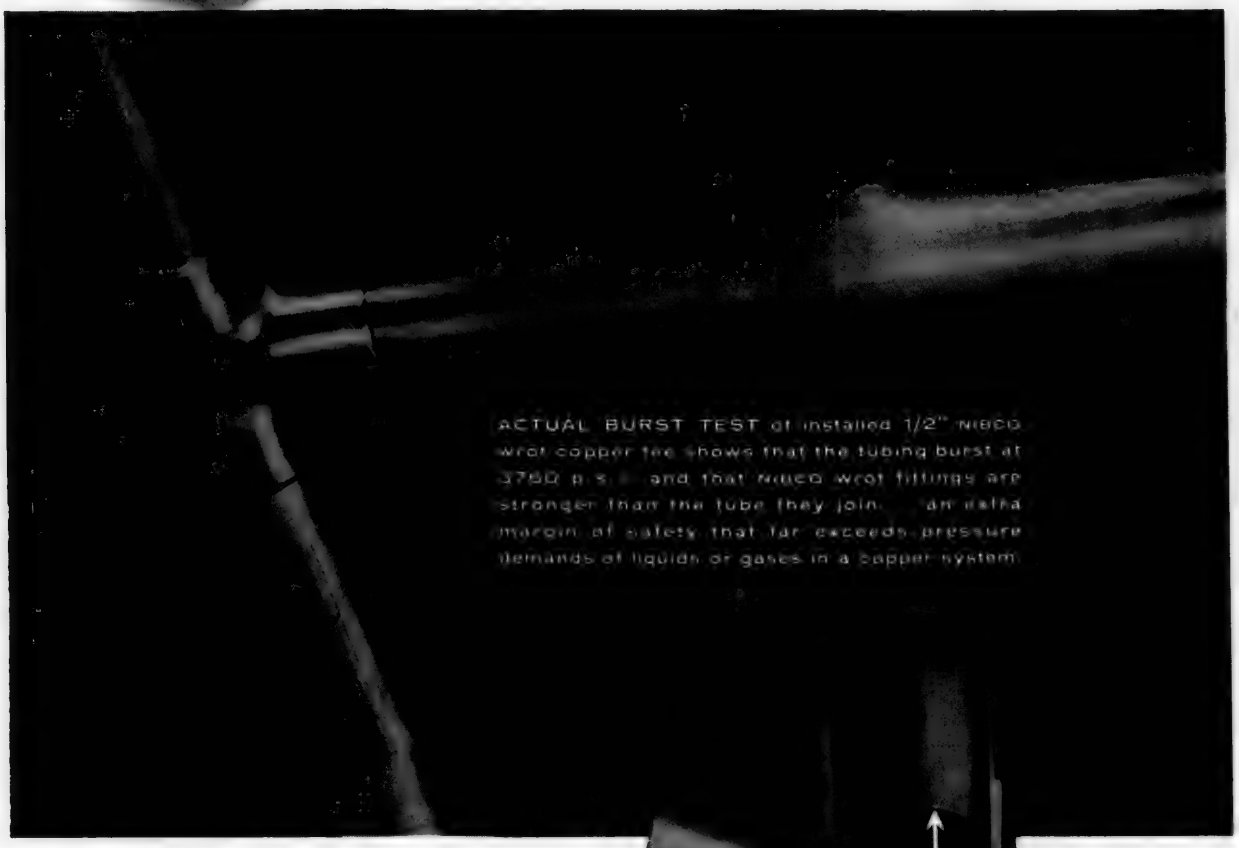
Developed by the John B. Pierce Foundation, of New Haven, Conn., the system is completely hydronic, combining cooling and heating functions in one relatively simple package. Basically, it consists of baseboard radiation mounted on outside walls near the ceiling. This creates, during winter operation, a heated air layer under the ceiling which, in turn, furnishes radiant warmth to objects below. During summer operation, the system cools air which then flows downward, by gravity, over heat-transmitting outside walls.

Also announced at the meeting was I-B-R's intention to embark upon an expanded and more efficient statistical program. Emphasis will be placed upon the replacement type of installation to determine how many cast iron boilers are replacing old cast iron boilers, steel boilers, or warm air furnaces.



When you compare copper fittings...

remember David and Goliath!


ACTUAL BURST TEST of installed 1/2" NIBCO wrot copper tee shows that the tubing burst at 3750 p.s.i. and that NIBCO wrot fittings are stronger than the tube they join. An extra margin of safety that far exceeds pressure demands of liquids or gases in a copper system.

Like David of old, NIBCO wrot copper fittings are strong where it counts. Wall thicknesses in the NIBCO "zone of strength" (as shown in the cutaway tee, for example) are not made to the "L" minimum ASA standard, but have heavier than "K" wall thickness of metal...additionally densified in processing. This is but one reason why NIBCO fittings are specified by the nation's leading contractors and service organizations. See your NIBCO wholesaler, or send coupon for ***FREE CATALOG.***

NIBCO

NIBCO INC.—Dept. J-6312 Elkhart, Indiana

Please send "Catalog I" of NIBCO fittings.

name _____

firm _____

address _____

city, state _____

ELECTRONIC SEARCHING SERVICE

(Continued from page 10)

tories, libraries, governmental agencies, engineering and scientific bodies, plus numerous other organizations requiring broad specific metals information.

The National Science Foundation is now considering a proposal to cover adjoining or overlapping fields of science. Foundation approval of this amplification of the searching service will greatly enhance its value to subscribers, according to Mr. Putnam.

Additional information may be procured from the American Society for Metals, Metals Park, Novelty, Ohio.

SUBSTANTIAL PROGRESS CITED IN OIL-BURNER RESEARCH

Substantial progress in establishing a petroleum industry program of oil-burner research was reported by an American Petroleum Institute consultant.

The report was made by David W. Locklin of Battelle Memorial Institute, Columbus, Ohio, at a meeting of the Fuel Oil Committee of the API in Chicago. Mr. Locklin is research consultant to the committee.

A study of research possibilities already has stimulated industry-wide interest in improving oil burners, Mr. Locklin said. Research is under way, he said, in the atomization of fuels, fuel-air mixing, catalytic and surface combustion, combustion acoustics, new fuel-oil uses, new types of burners, modifications of existing burners, and improvement in field installations to assist marketing and servicing organizations to retain their present customers.

Within two or three months, a bibliography and review literature will be established to speed the communication of new ideas and data to all the industry.

The first of several technical discussion conferences has been held uncovering "significant research results, including new and unpublished data," the consultant said. He estimated oil refiners now are spending about $500,000 a year on fuel-oil research.

Mr. Locklin listed as concepts having promise of future research: controlled recirculation of combustion products, catalytic and surface combustion, vaporization in precombustion zones, unsteady-state combustion, unusual atomization techniques, and modified systems for combustion air.

Research men, he said, also are considering less familiar uses for fuel oil. Among these he listed uses for household appliances and direct generation of electricity.

TWO TEAMS OF PLUMBERS COMPETE UNDER SUPERVISION TO PROVE THAT COPPER PLUMBING IS FASTER TO INSTALL

To prove that all-copper plumbing can be installed faster and at less cost than ferrous piping, a copper tube manufacturer sponsored timed comparative installations of two identical rough plumbing systems, one in copper, the other in ferrous pipe, in two identical framed structures.

Tools used in copper tube installation (top) and ferrous pipe (bottom) installation are shown for comparison following completion of copper installation at end of first day. Note condition of plumbers after having worked the same length of time with the two materials. Copper weighs about one-third as much as cast iron.

Performed under field conditions in Waterbury, Conn., on October 22, and sponsored by Chase Brass & Copper Co., subsidiary of Kennecott Copper Corporation, the installations were done simultaneously by workmen of the plumbing firm of Romaniello Bros., Inc. All work was done under the close supervision of the Waterbury Plumbing Inspector, Wilfred Garrity, and two instructors from local plumbing apprentice training centers.

Two identical structures were constructed indoors to eliminate the possible effects of weather. All materials and tools were ordered and delivered to the site in advance. No prior study of the schematic of the plumbing layout was allowed so that both teams began work on an equal footing. At least one supervisor was present to observe progress at all times and work was restricted to a normal working day of eight hours with a half-hour for lunch.

Save 2¾ Hours

When the two installations were finished, it was established that the all-copper system was completely installed in 7½ hours, as opposed to 10¼ hours for the ferrous system. Thus the all-copper system took 27% less time to complete. Total cost of the copper system, installed, was $209.09, and the ferrous system $233.97, including materials, labor, overhead, and profit for the contractor. The system design was that of a typical low-cost home and included a full bath and a kitchen with provisions for a dishwasher or washing machine, all on one floor.

Tabulations of materials employed were determined by listing them as the two systems were torn down, so that only the costs of materials used were included in cost analyses.

Savings Will Vary

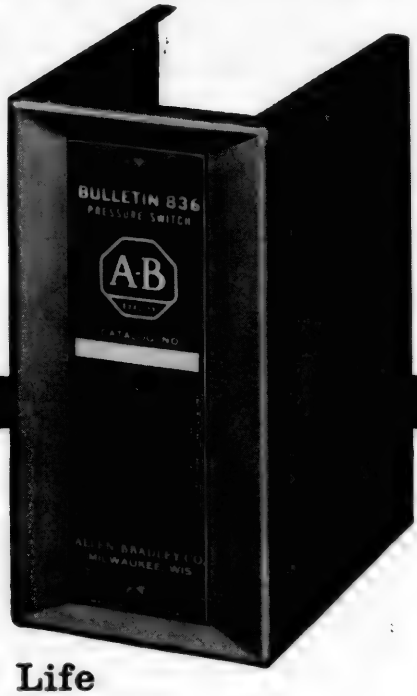
According to Chase executives, the economies of using all-copper plumbing as proven by the direct comparison depend upon a number of local factors. The major savings are in

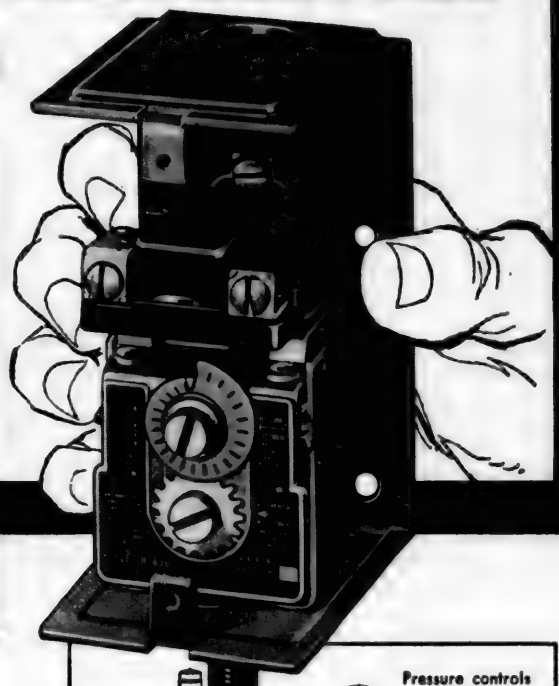
(Concluded on page 123)

NEW

Allen-Bradley Air Conditioning and Refrigeration

PRESSURE and TEMPERATURE CONTROLS





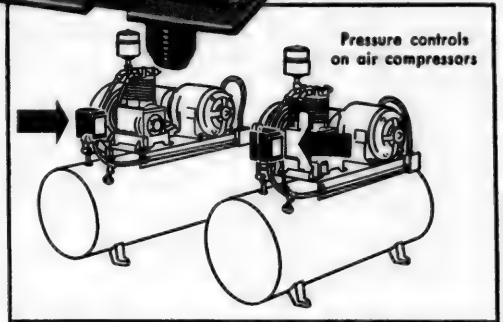
Longer Life
Lower Differentials
Attractive Appearance

Using an improved bellows design, these *new* A-B controls combine exceptionally low differentials with extremely long life — even when cycled from zero to maximum setting. Both the range and differential setting are easily adjustable —and a scale shows the operating point of the control.

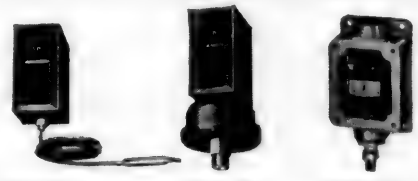
The precision snap-action switch in these controls has no "dead center"—operation is absolutely positive. Vibration or mounting angle cannot cause faulty operation. And the pure silver contacts assure millions of trouble free operations—without maintenance.

For accurate and reliable control of pressure or temperature, you'll find nothing to equal these new controls—they're A-B *quality* throughout. Don't delay — write for details.

Allen-Bradley Co., 1330 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.



Pressure controls on air compressors



Bulletin 837 Temperature Control equipped with capillary tube and bulb.

Bulletin 836 Pressure Control for low pressures.

Bulletin 836 Pressure Control in NEMA Type 4 enclosure.

TEMPERATURE RANGES
From −150°F to 490°F

PRESSURE RANGES
From 30" vacuum (Hg) to 900° psi

Quality Motor Control

Scientific Frontiers

Many of the items reported here over the last two years under the general category of "Scientific Frontiers" are rapidly losing much of their "frontier" quality. They are upon us, either in the form of commercially available items, or as ideas and concepts that are reaching recognition, if not fruition. Three cases in point are fuel cells (November, 1959), tidal energy (May, 1958), and thermoelectricity (December, 1958).

● Allis-Chalmers Manufacturing Co. has recently demonstrated the first vehicle powered by fuel cells, a source of energy which the company said some day may provide electric power for homes and factories, and possibly military weapons or space vehicles. The fuel-cell-powered vehicle is an experimental tractor of commercial size. It develops at least 3000 lb of drawbar pull, enough to drag a two-bottom plow through hard, dry ground. Electricity that drives the tractor comes from 1008 individual fuel cells. These are joined in 112 units of nine cells each. The 112 units are arranged in four banks, and electricity can be taken from any combination of the banks. A mixture of gases, largely propane, fuels the cells.

● An international board of engineers has reported that expenditure of more than a half-billion dollars to generate electricity from the tides of Passamaquoddy Bay is economically justified. Passamaquoddy Bay lies on both sides of the United States-Canadian boundary, between Maine and New Brunswick, Canada. It is an arm of the Bay of Fundy, which has the greatest tidal movement in the world, amounting to more than fifty feet. The report, based on a three-year survey, takes much of the fantasy out of the forty-year dream.

The engineers reported that a tidal power project at this location can be built and operated to produce an average annual energy output of 1,843,000,000 kwh. The engineers concluded, however, that for maximum power benefits, the project would have to be combined with an auxiliary power source. They determined that the most favorable arrangement would be to combine the tidal power with a hydroelectric auxiliary at the Rankin Rapids site on the upper St. John River in Maine.

● Whirlpool Corporation announced the development of four new thermoelectric devices at a symposium held recently in Washington, D. C. Attending the conference were members of the Armed Services and Government interested in and concerned with all aspects of thermoelectricity.

The new devices described include a compact water purification apparatus which uses the dual-effect thermoelements simultaneously for evaporating and condensing, thus eliminating the large quantities of cooling water presently required. A second development is a multi-compartment food cabinet for long range aircraft personnel which holds pre-cooked meals in a frozen state until a few minutes before serving time when, by merely reversing the electric current flow through the thermoelements, the refrigerated compartment containing the individual meal becomes an oven and quickly heats the meal to serving temperature without affecting other frozen meals contained in the cabinet.

Two further devices utilize the principle of a thermocouple. In one, an electric current generated directly by otherwise wasted heat, operates a Sprengel-type mercury pump suitable for gases and liquids. The other utilizes a thermal junction and mercury to operate gas or fluid valves.

● And, according to Westinghouse Electric Corp., the fighting man of the future may be individually air conditioned. Placed inside a protective garment, a miniature air conditioner would create an artificial environment, keeping the man dry and comfortable at temperatures ranging from the below-zero cold of the far North to the searing heat of the tropics.

Dr. R. A. Ramey, manager of the company's new products engineering department, said that the air conditioner is being developed for the clothing and textile division of the U. S. Naval Supply Research and Development Facility, Bayonne, N. J., where it will be built into an experimental "lightweight, impermeable, insulated, personnel protective garment." The complete air conditioner will consist of three main components: a thermoelectric cooling and heating unit, a lightweight battery power supply, and a blower system to circulate the air inside the unit. The air conditioner will be designed to maintain the temperature in the suit at comfortable levels, roughly equal to that normally encountered on a pleasant summer day, while the suit is being worn in temperatures ranging from 40 below zero to 135 deg. F.

The conditioned air circulating inside the Navy suit will not be used for breathing purposes. A separate external system, provided by the Government, will supply air for respiration. Efficient, rechargeable batteries will power the air conditioner and supply enough electrical energy to operate the suit for a minimum of one hour. In addition, the suit will be designed so that it can be plugged into an external power source to be used when time and conditions warrant.

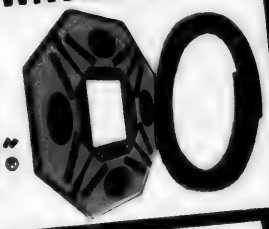
This is in addition to other Westinghouse commercial developments in the field of thermoelectricity, including a clock-controlled bottle warmer and cooler, a mobile hostess cart with both refrigeration and oven compartments, and a "hot-cold-light" panel which combines into a single operating unit thermoelectric cooling and heating and electroluminescent lighting.

IN TUBING, Nothing Beats Copper! IN COPPER TUBING, Nothing Beats READING!

For COPPER WATER TUBE

Specify

READING "LEKTRONEAL"®



For COPPER REFRIGERATION TUBE

Specify

READING "LEKTROSEAL"®

Also Specify READING

for
- COMMERCIAL COPPER TUBE
- RED BRASS & COPPER PIPE
- THREADLESS COPPER PIPE

For FINNED COPPER TUBE

Specify **READI-FIN®**

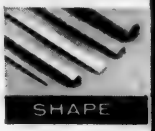
READI-FIN TYPE W/H

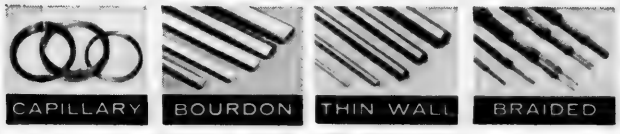
A line of heat transfer tubing made by Readi-Fin Mfg. Co., Inc. (a subsidiary of Reading Tube Corp., at Reading, Pa.). The extended surface is extruded from the tube wall, thus eliminating the possibility of fin failures resulting from thermal shock, corrosion and erosion. This "one-piece" (integral) construction provides maximum heat transfer efficiency, ruggedness, easy fabrication and freedom from fouling. It's available in Water Tube types with finned or plain ends and in Condenser Tube types with finned, plain or stripped ends.

For PRECISION COPPER TUBE

Specify **MACKENZIE WALTON**

(A Subsidiary of READING TUBE CORP.)
PAWTUCKET, R. I.





- Famous for Accurate and Fine Finish Tubing
- Quality Controlled from Start to Finish

READING COPPER BRASS TUBE And RED BRASS PIPE

Sold Through Wholesalers Only

MADE IN U.S.A. TO THE STANDARDS OF AMERICAN INDUSTRY

READING TUBE CORPORATION

Empire State Building, New York 1, N. Y., Plant: Reading, Pa.

Distribution Depots:

READING, PA.	**WOODSIDE, L. I., N.Y.** 57-17 Northern Blvd.	**PHILADELPHIA, PA.** 921 Penn St.	**CHICAGO, ILL.** 305 W. 31st St.	**CLEVELAND, OHIO** 4615 Perkins Ave.
ATLANTA, GA. 690 Murphy Ave. S.W., Unit 5, Bldg. B	**OAKLAND, CALIF.** 410 Hegenberger Rd.	**LOS ANGELES, CALIF.** 120 No. Santa Fe Ave.	**DENVER, COLO.** 2845 Walnut St.	**HOUSTON, TEXAS** 1121 Rothwell St.

DALLAS, TEXAS—9000 Sovereign Row, Brook Hollow Industrial District

TOUGH BUYERS DEMAND REZNOR FIVE-WAY HEATERS

to project heat where needed on "difficult" jobs... with no waste!

When cranes, production machinery or huge inventory stacks require abnormally high heater placement, you *have* to be a "tough buyer" to do a proper heating job! You have to deliver a unit that will project heat where it's needed . . . with no waste of fuel *or* heat. That's why so many heating contractors now demand the new Reznor Five-Way Heater, which projects heat downward, even from a height of 40 feet, to the spot where heat is needed, and (with the optional 5-way diffuser) in as many as five directions at once!

LOWER FUEL COSTS—By spotting heat accurately, the Five-Way Heater maintains complete comfort with less fuel; keeps fuel bills low.

LOWER INSTALLATION COSTS—The entire assembly installs quickly, requiring only gas, flue and power connections.

Available with aluminized or stainless steel heating elements and gas modulation. Electric ignition is optional.

For information, phone your Reznor distributor, or write Reznor Manufacturing Co., Dept. 64C, Mercer, Pa.

The heating world is full of tough buyers; that's why Reznor is the world's largest selling direct-fired heater!

REZNOR HEATERS

"THE TOUGH BUYERS' LINE"

Seeing is believing with the Sporlan *See•All*

....the amazing single dot moisture and liquid indicator that takes the guess work out of servicing refrigeration equipment

A Single Green Dot indicates when the system is DRY... a Full-view Sight Glass shows if the system is Fully Charged!

Seeing is believing! When the indicator is green...system is dry...no worries. When yellow...system too wet...danger ahead, immediate action necessary. When chartreuse...the caution range or warning signal...change drier before serious trouble develops. These color changes are supported by accurate calibrated data giving the moisture content in PPM at various liquid line temperatures. The color change is completely reversible, and changes as the moisture content of the system varies.

The See•All may be installed anywhere in the liquid line... for convenient visual inspection...and for liquid lines larger than ⅝", a new by-pass kit is now available. Same accurate moisture and liquid indication readings...eliminates added cost of sightglass or indicator of full line size.

The single dot indicator of the *See•All* works equally well on Refrigerants 12–22–40–500.

Order See•Alls from your Sporlan Wholesaler today... and believe what you see ...avoid the possibility of moisture problems.

Further...add Catch-Alls to the order for perfectly clean, dry, acid free refrigeration and air conditioning systems.

Ask for **Bulletin 70-10**

Our 25th Anniversary ... 1934...1959

SPORLAN VALVE COMPANY

7525 SUSSEX AVENUE ST. LOUIS 17, MISSOURI

EXPORT DEPT. 85 BROAD STREET NEW YORK 4, NEW YORK

Look how Pittsburgh Fiber Glass Insulation Products provide top thermal and acoustical control... help you save installation time

Check these Pittsburgh Fiber Glass Insulation advantages:

Lightweight—adds only negligible additional weight to any job.

Easily handled—readily cut with knife, shears or die; flexibility provides fast installation.

Dimensional stability—does not shrink or stretch, assuring long-lasting insulation control.

Inorganic—not affected by moisture or heat, will not rot, mildew, oxidize or age; flame resistant, odorless.

Economical—requires less bulk for effective insulation as compared with ordinary insulation; easy application cuts time costs.

FOR ALL-AROUND PERFORMANCE, SPECIFY PITTSBURGH FIBER GLASS INSULATION

In new construction, modernization or routine maintenance, for piping or duct work, insulation products by PPG will give you the quality acoustical or thermal service you're looking for. For more information, call your nearest PPG Sales Office, or write to *Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Pa.*

Sales Offices: Atlanta, Attleboro, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Fort Wayne, Houston, Jacksonville, Kansas City, Los Angeles, Louisville, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco and Washington

Pittsburgh Superfine Duct Insulation

FOR THERMAL CONTROL

wrap-around fiber glass insulation, available in a variety of facings . . . shipped in blanket form . . . lightweight, easily handled . . . clean, non-irritating, odorless . . . good appearance . . . high thermal efficiency . . . flexible, resilient . . . readily fits any desired dimension . . . can be glued, tacked, taped or tied.

Pittsburgh Superfine Duct Liner

FOR THERMAL AND ACOUSTICAL CONTROL

coated with neoprene to prevent air erosion and reduce air resistance . . . low k factor . . . shipped in easy-to-handle lightweight rolls . . . easily cuts to correct size . . . can be glued, tacked or taped . . . can be applied to flat sheet before forming.

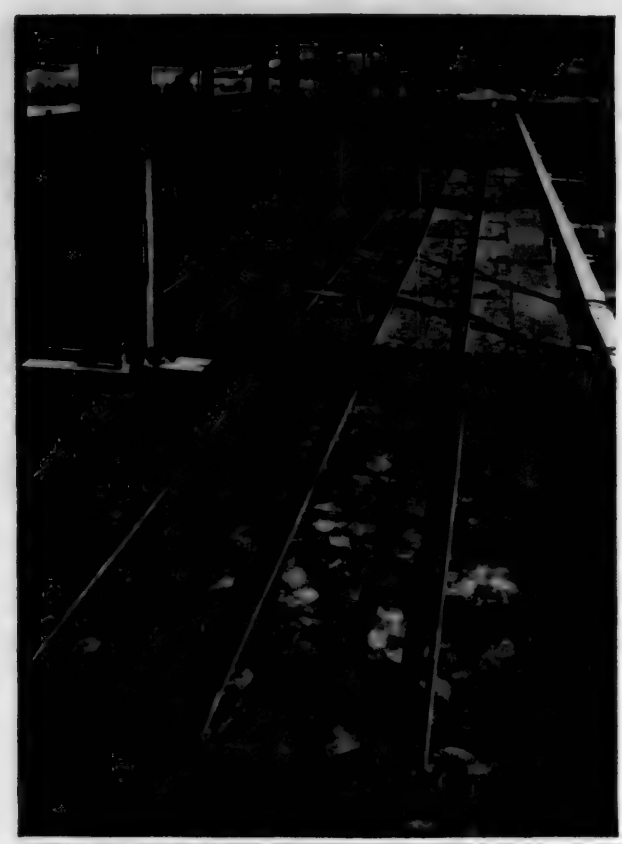
Pittsburgh Pipe Insulation

FOR THERMAL CONTROL

molded into a flexible hollow cylinder, slit along its length to provide quick application to pipes or tubing . . . provided in three-foot lengths, with or without jackets, in nominal wall thicknesses ½", ¾", 1" and 1¾" in all standard IPS and CWT sizes . . . has high thermal efficiency . . . low maintenance.

FIBER PG GLASS PITTSBURGH PLATE GLASS COMPANY

27,000 feet of heat...

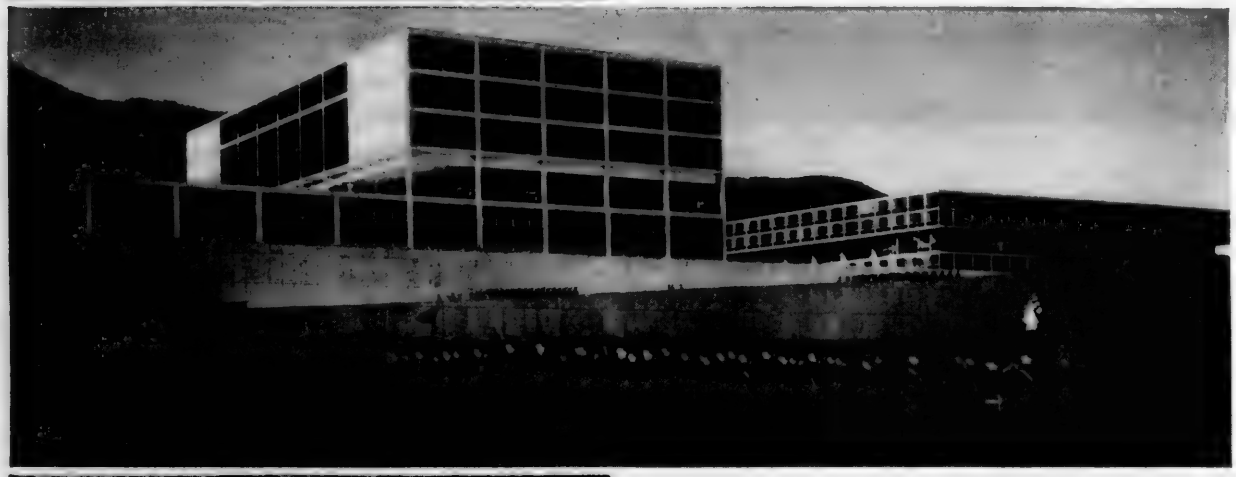


Here, at the U. S. Air Force Academy, near Colorado Springs, Colorado, the most modern equipment in the world has been used to provide for the comfort and safety of America's future sky-generals. For instance, a huge radiant heating installation, featuring almost 27,000 feet of ¾-inch USS National Steel Pipe, serves the Cadet Quarters Complex.

For installations such as the Air Force Academy, architects and contractors consistently look to USS National Pipe. As a matter of fact, they've been specifying National for more than 60 years for conventional plumbing and heating systems. It makes sense, too! You know why? Because National Pipe has the qualities to meet the requirements of these applications . . . smooth, uniform bending . . . sound, strong welding . . . and long service life. These qualities have made USS National Pipe the largest selling pipe in the world. For more information, write to National Tube Division, United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

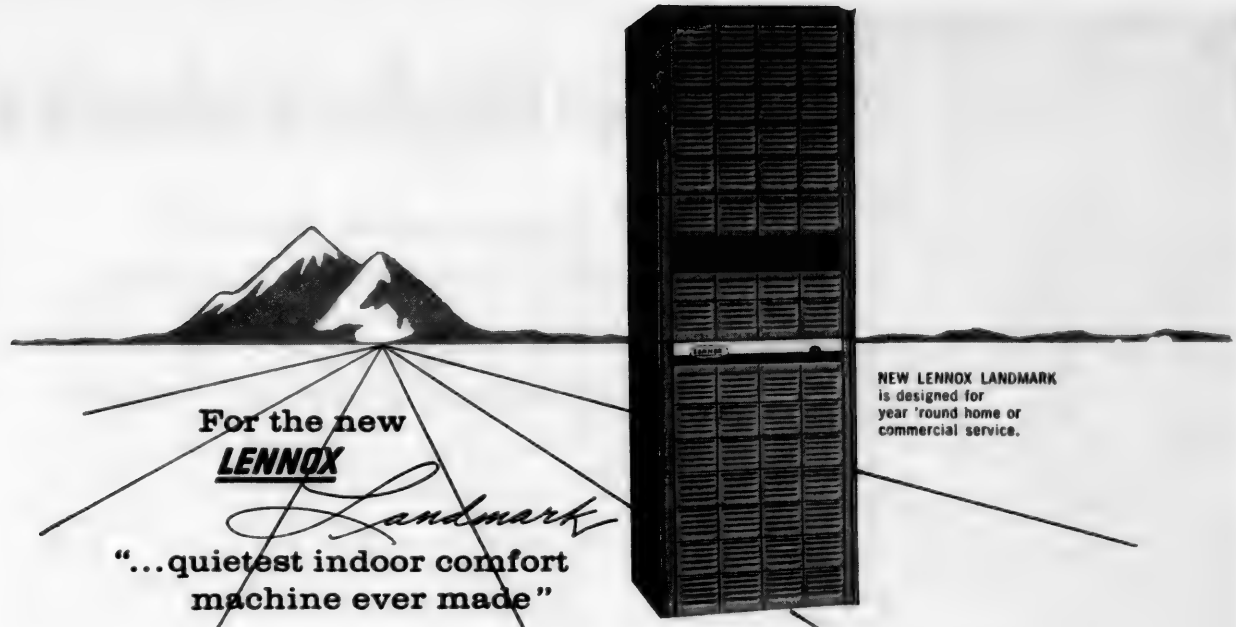
USS and National are registered trademarks

The world's largest and most experienced manufacturer of tubular products



USS National Tube Division of United States Steel

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
United States Steel Export Company, New York



NEW LENNOX LANDMARK
is designed for
year 'round home or
commercial service.

For the new
LENNOX
Landmark
"...quietest indoor comfort
machine ever made"

FAFNIR Super-Quiet BALL BEARINGS

"...finest bearings obtainable for this service"

In the all-new Lennox Landmark, whisper-quiet service is as much a comfort feature as unique "made-to-measure" heating and cooling provided by interchangeable components — a Lennox innovation.

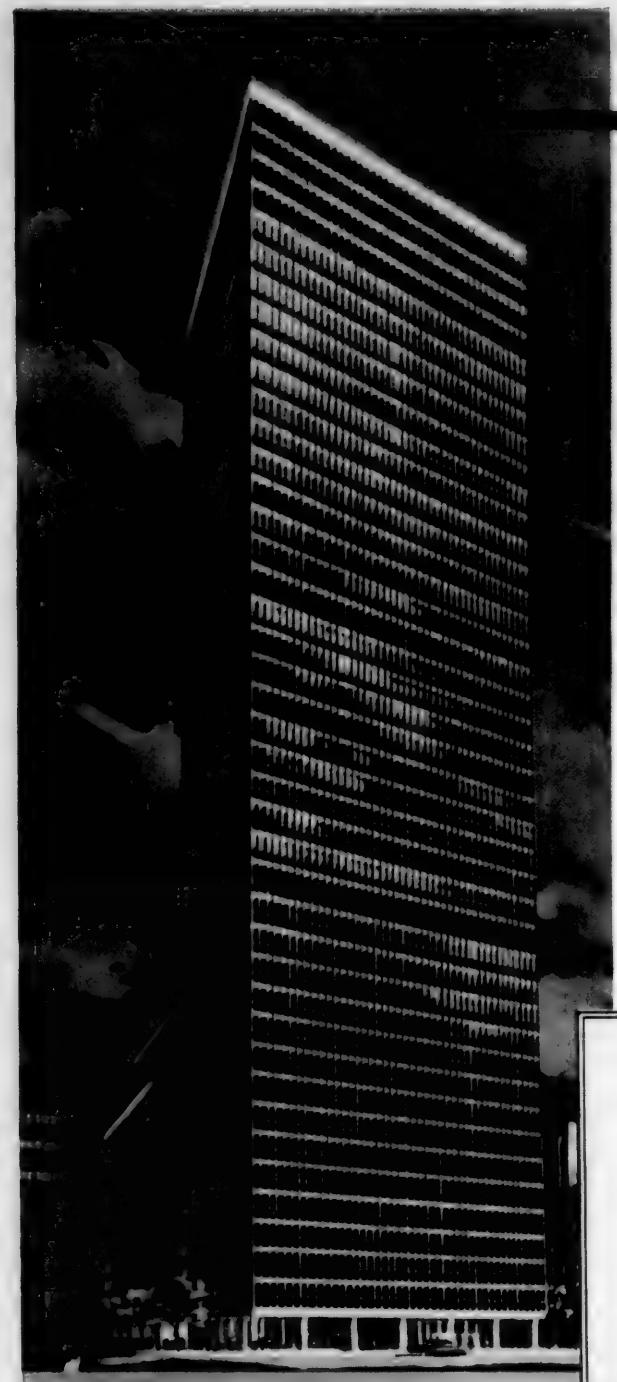
Uncompromising emphasis on noiseless operation in the development of the versatile Landmark is well borne out by specification of Fafnir Super-Quiet Ball Bearings for the blower shaft mountings.

Balls and races of these Fafnir bearings are specially finished for soundless service. Virtually wear-free bearing steel, lifetime factory lubrication, and positive Plya-Seal protection against dirt, moisture, and loss of lubricant assure quiet, maintenance-free bearing performance through all seasons, year after year.

Take advantage of the job-designed features Fafnir builds into bearings and bearing units for heating and cooling equipment. You'll find a complete selection of types and sizes. Write for new bulletin to The Fafnir Bearing Company, New Britain, Connecticut.

FAFNIR SUPER-QUIET BALL BEARINGS on the blower shaft assure silent, power-saving, maintenance-free bearing performance. They are permanently prelubricated and sealed. Specially-developed current-conducting rubber is used when bearings are supplied with grommets, or in rubber cartridges or pressed steel pillow blocks.

FAFNIR
BALL BEARINGS
MOST COMPLETE LINE IN AMERICA



Skidmore, Owings & Merrill, Architects
Moyer, Strong & Jones, Mechanical Engineers
Turner Construction Co., General Contractor
Kirby Saunders, Inc., Mechanical Contractor

High-Velocity

for the new Equitable Life Assurance Society Building . . . World's Largest Single Occupancy Tower

In matters that concern health, few institutions are more aware of the problems than the Equitable Life Assurance Society of the United States. In their new office building in New York—the world's largest single-occupancy office building—approximately 1,250,000 cubic feet of air per minute will be kept super clean by Cambridge AEROSOLVE 95 filters.

With a discoloration efficiency of 95% on atmospheric dust, the AEROSOLVE 95 removes not only visible dust, but also the invisible smudge-producing particles, such as the aerosols in smoke, which cause high cleaning and maintenance costs and which may constitute a health hazard.

INSTALLATION DETAILS

Approximately 1,250,000 C.F.M. in 32 separate systems

Filters, Model 43D-95 Cambridge AEROSOLVE
- 1800 C.F.M.
- 450 F.P.M. face velocity, resulting in minimum space requirements
- Dimensions 24" x 24" x 24"
- Permanent cadmium-plated frames
- Underwriters Laboratory Class 1 rating

Cambridge Filter®

AEROSOLVE® Filters SPECIFIED

HIGHLY EFFICIENT ON ATMOSPHERIC DUST

In removing smudge-producing atmospheric dust, the AEROSOLVE 95 Filter has an efficiency of 90-95% (NBS discoloration test method) — higher than most electronic precipitators — 10 times as high as ordinary panel filters.

Easy Cartridge Replacement ... No Other Maintenance Required

Except for infrequent cartridge replacement, Cambridge AEROSOLVE Filters require no maintenance. No electric, water or drain connections are needed. The permanent cadmium-plated steel frames are easily installed, and the cartridges are secured by quick-acting fasteners which make them exceptionally easy to remove and replace.

High Velocity

Cambridge High-Velocity AEROSOLVE Filters have been specially designed to match today's coil velocities. They save valuable space — obviate the need for expensive duct transitions.

RELIABLE Filtration

Cambridge AEROSOLVE Filters provide POSITIVE air cleaning. They do not depend upon electric current — there is no chance of break-through. There is never a fall-off in cleaning efficiency; in fact, efficiency increases as the dirt load in the filter increases. Safe, reliable.

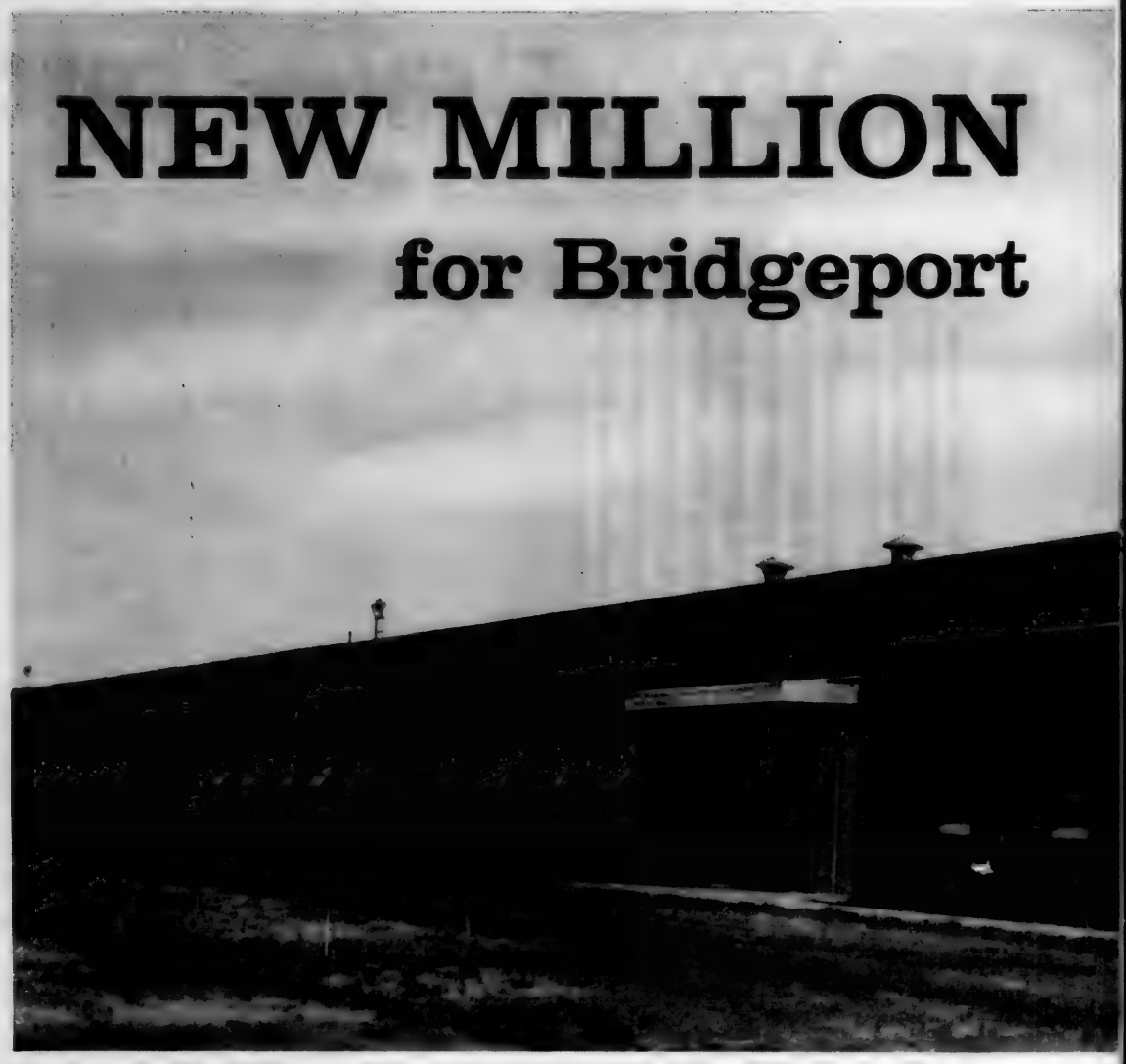
Investigate this new method of low-cost, high-efficiency air cleaning

Write for Bulletin 130

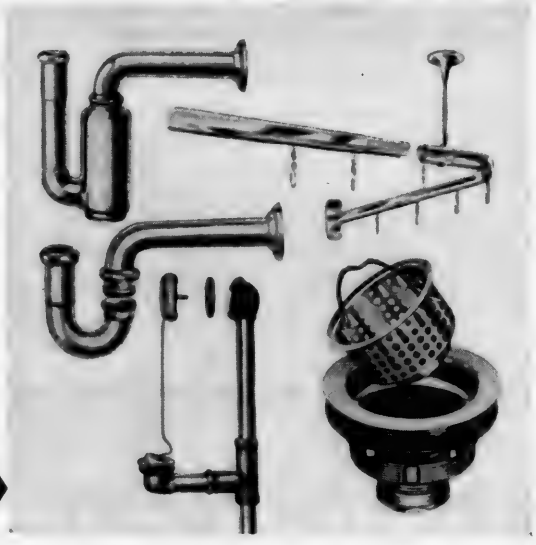
Corporation

734 E. Erie Blvd., Syracuse 1, N.Y.

NEW MILLION
for Bridgeport



Straight line production systems speed processing, cut time on materials handling. Here racks are being loaded in preparation for the triple plating process.



Bridgeport's plumbing brass goods are designed to meet the highest standards of sanitation and conform with all code regulations. Traps, Sink strainers and Traxrod shower curtain rod are all part of the complete line produced in our new plant.

BRASS Bridgeport CO.

BRIDGEPORT

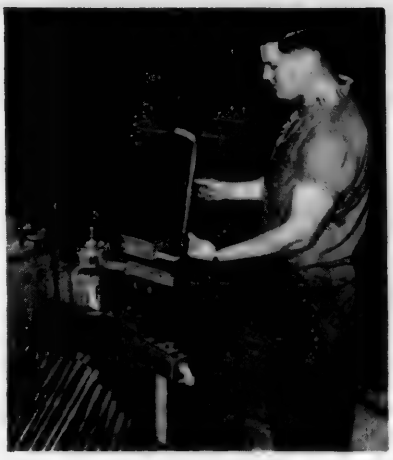
Bridgeport 2, Connecticut

DOLLAR PLANT
Plumbing Brass Goods

Moultrie, Ga. One of the world's most modern plumbing brass goods plants is now in operation. Designed to make efficient use of the latest automation techniques and equipment, the plant at Moultrie, Ga. will produce Bridgeport's full line of plumbing brass goods to the finest quality obtainable.

Customer service will be better-than-ever. The new plant will be self-sufficient. All stages from receipt of orders, through manufacturing and shipping, to final invoicing will be handled under one roof. The latest IBM equipment will keep paperwork flowing smoothly.

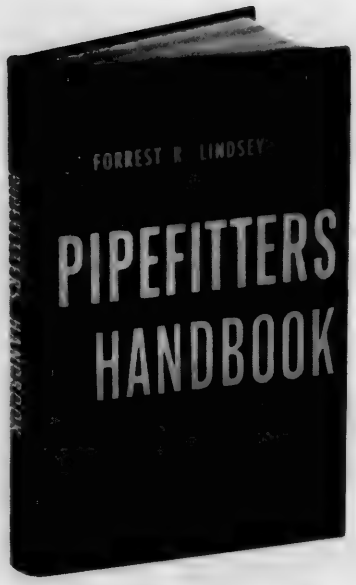
For the finest *quality* line of plumbing brass goods backed by the finest service in the business . . . remember to specify Bridgeport. And when you're installing them on the job, install them with Bridgeport Copper Water and Drainage Tubes.



This machine automatically processes precut lengths of straight tube, bends them into 'J' shaped trap bodies...all in one continuous operation.

BRASS COMPANY

Specialists in Metals from Aluminum to Zirconium



New, Enlarged Second Edition of Sell-out Shop and Field Manual

Gives 44% More Ready-to-Use Information at NO Increase in Price!

Pipefitters, steamfitters, layout men, contractors, plumbers—anyone concerned with the layout and installation of pipe—can find ready answers to all pipefitting problems in the PIPEFITTERS HANDBOOK. To save time in bending, fitting, welding, offsetting, joining or laying out pipe, just open PIPEFITTERS HANDBOOK to the appropriate, easy-to-find table, and do the job quickly without complex calculations.

This book is based on the actual working notebook of a successful pipefitter with 35 years' experience. Forrest R. Lindsey knows his craft and knows what YOU need to save time in the field or in the shop. Every working table has an easy example of how to use it and is backed up by data you can apply in your work: Laying lengths and dimensions of all standard pipe (including plastic) and fittings, screwed, welded, soldered or flanged; pipe support spacing; how to make joints at any angle; construction of brackets; areas and volumes of many different shapes; and much more shown in the table of contents at the left.

The second edition provides 126 more pages of useful information on many more subjects than the first. It extends the range of time-saving tables for bending and offsetting pipe and covers additional kinds of pipe and fittings. A complete, new treatment of plastic pipe, and a comprehensive subject index are included.

Ideal for use in the shop or in the field, PIPEFITTERS HANDBOOK is designed for long life and service. Handy to use, in a convenient pocket-size, it is printed in large black, non-smudge type on durable paper. You'll want it with you on every job . . . in the shop or in the field. Send for it today!

416 pages
248 illustrations

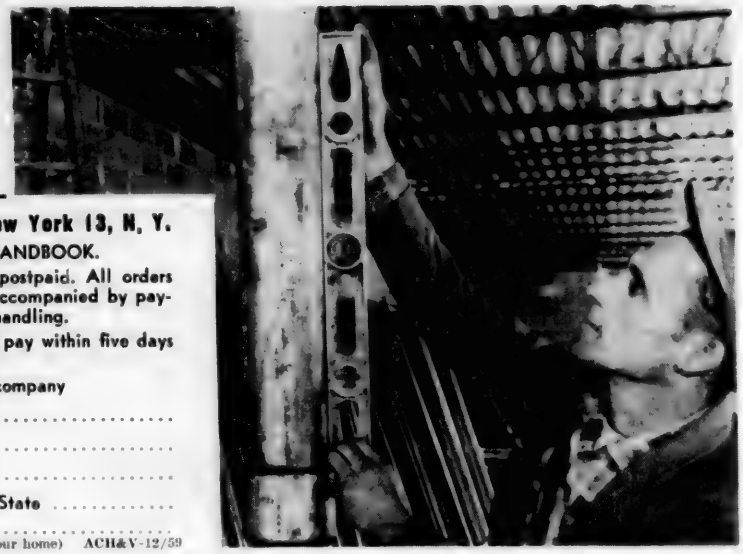
$6.00

Indexed
4¼" x 6⅜"

To order use handy coupon below or circle letter P on postpaid card last page.

CONTENTS

PIPE BENDING: *Setback and Length of Bend—Offset and Crossover Bends—Expansion U-Bends—90° Turns—Coils—Minimum Bending Radius—Wrinkle Bends.* SCREWED OFFSETS: *Common Offset Connections—Travel and Run—Rolling Offset—Screwed Turns—Screwed Coils.* MITERED JOINTS: *Welded Turns—Mitered Coils—Mitered Brackets—Templates for Mitering.* PIPE DIMENSIONS: *Iron and Steel Pipe—Copper Tube.* SCREWED FITTINGS: *Threading Pipe—Standard Threads—Fitting Dimensions—Clearance for Turning—Laying Lengths.* BUTT WELDING FITTINGS: *Elbow, Tees and Crosses—Valves.* FLANGES AND FLANGE FITTINGS: *Drilling Flanges—Fitting Dimensions—Valve Dimensions—Flanges and Gaskets.* SOLDER JOINT FITTINGS: *Soldering and Brazing.* U-BOLTS. SPACING OF HANGERS. WATER IN PIPES. PIPE EXPANSION. CONTENTS OF TANKS. IDENTIFICATION OF PIPING SYSTEMS. VALVES. PLASTIC PIPE: *Dimensions and Pressure Limits—Characteristics.* METALS: *Spark Tests—Sheet Metal Weights—Weights and Melting Points.* STEAM. MATHAMATICAL DATA: *Circumferences and Areas of Circles—Squares and Square Roots—Areas and Volumes—Reciprocals of Numbers.* WEIGHTS AND MEASURES. CONVERSION TABLES: *Inches to Decimals of a Foot—Fahrenheit-Centigrade—Feet of Water to psi—Psi to Feet of Water—Cubic Feet to Gallons—Gallons to Cubic Feet—Miscellaneous Conversion Factors—Useful Formulas.* TRIGONOMETRY: *Trigonometric Functions—Right Triangle Formulas—Solving Problems.* FIELD LAYOUT OF ANGLES: *Angles on the Steel Square—Angles on the Six-foot Rule.* PIPEFITTERS DICTIONARY.



THE INDUSTRIAL PRESS, 93 Worth Street, New York 13, N. Y.

Please send me ..... copies of PIPEFITTERS HANDBOOK.

☐ Check or money order is inclosed. Send book(s) postpaid. All orders from foreign countries—except Canada—must be accompanied by payment in full including 50c per book postage and handling.

☐ Send book(s) and invoice including postage. I will pay within five days if I decide to keep the book(s).

☐ Bill me ☐ Bill company

Name .....

Company .....

Company Address .....

City ..... Zone ..... State .....

Home Address .....

(Fill in last line only if you want book sent to your home) ACH&V-12/59

NEW "BUFFALO" AIR-COOLED CONDENSERS OFFER TROUBLE-FREE OPERATION

Troubles common to most air-cooled condensers are positively eliminated by these field-tested new "Buffalo" units.

"Buffalo" Air-Cooled Condensers are a sound engineering choice for your "problem" air conditioning installations. They are ideal for overcoming such conditions as weight and erection difficulties—high maintenance costs —winter freezing troubles—winter head pressure problems — water shortages — contaminated water — high water cost—high sewer tax—poor drainage.

"Buffalo" Air-Cooled Condensers offer these and many more advantages for air conditioning applications. For full details, call your nearby "Buffalo" engineering representative. Or write us direct.

Easy-to-Install! Shipped as factory-assembled "packages." Lifting eyebolts simplify rigging.

Trouble-Free Operation! Service calls are practically nil, thanks to quality construction and unique control design.

Capacities: 7½ to 100 tons based on 120° condensing temperature, 40° suction, 100° ambient.

Vertical Discharge is unaffected by wind velocity. Holds compressor on line.

Opposed Blade By-Pass Damper Control provides close modulating control not possible with parallel-blade dampers...or with "flooded coil control." Also saves expensive Freon.

Low Silhouette! The No. 1000 unit is only 76" high.

Unit Casings! Heavy-gauge galvanized steel construction for durable long life.

BUFFALO FORGE COMPANY Buffalo, New York

Buffalo Pumps Division, Buffalo, N. Y.

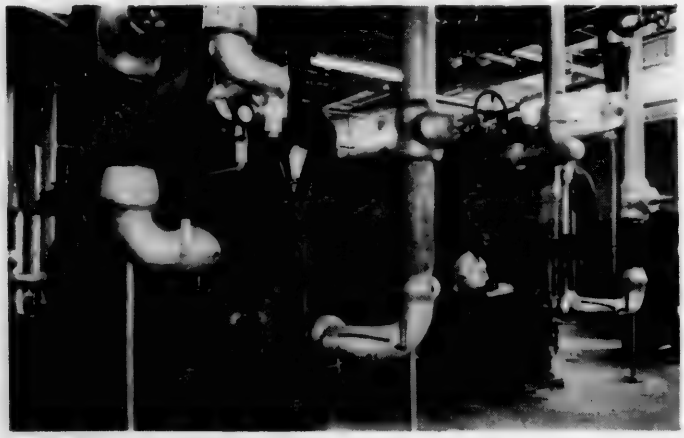
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo"

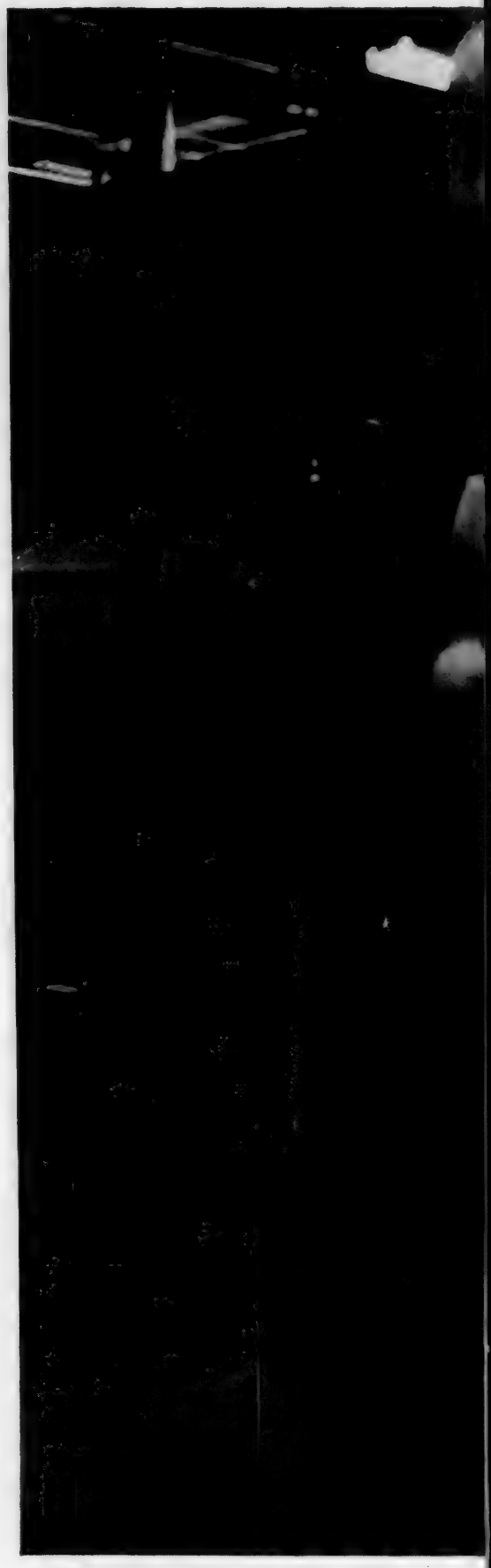
VENTILATING • AIR CLEANING • AIR TEMPERING • INDUCED DRAFT • EXHAUSTING • FORCED DRAFT • COOLING • HEATING • PRESSURE BLOWING

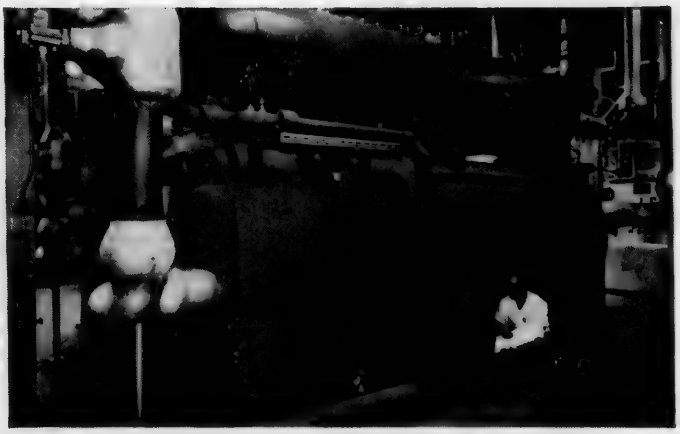
NO SUMMERTIME SLUMP With gas as the boiler fuel and York machines, the switch to summer cooling was no problem. Operating costs are low, too, thanks to Gas.

LATEST IN COOLING Gas operated York machines feature the use of tap water as refrigerant and lithium bromide as absorbent, one of the most efficient, practical refrigeration cycles developed so far. Machines start and stop automatically.



THE UTMOST IN FLEXIBILITY The units are cross-connected so that each operates independently if necessary.





MAINTENANCE COSTS TO DATE—ZERO! The Allen Company uses two York machines—a 230-ton unit serving 45,000 sq. ft. of office and cafeteria space, a 170-ton unit for process water cooling. Three small pumps and motors are the only moving parts in the entire system.

"with **YORK GAS** *air conditioning our boilers keep us cool all summer"*

"With our boilers sized for a winter load, we were naturally oversized for the summer months. But York's gas-operated Lithium Bromide absorption water chillers permit us to make efficient use of part of this steam capacity to cool," says Mr. M. J. Mather, President of the Allen Manufacturing Company, makers of hex-socket screws.

The York Lithium Bromide system eliminates the need for huge compressors found in other types of cooling equipment . . . which brings down the original cost considerably. And with gas the boiler fuel, you make year-round use of an otherwise wasted source of power *at rock bottom costs.* In addition, York machines are noiseless, lightweight, compact—easy to install and readily adaptable to almost any plant layout.

Find out how your present heating system can pay off for you all year 'round with gas-operated York automatic water chilling units. Call your local gas company or write to the York Corporation, Subsidiary of Borg-Warner Corporation, York, Pennsylvania. *American Gas Association.*

at Award Winning Linton High School*...

RIC-WIL
was specified and installed for the underground piping system

Architects: Perkins and Will; Ryder & Link
Consulting Engineer: E. R. Gritschke
Contractor: Tougher Plumbing & Heating Co.

RIC-WIL is indeed proud to be a part of the Linton High School Project. All of the firms participating in the annual awards are to be congratulated and encouraged in promoting better design of educational buildings. For over 49 years RIC-WIL has supplied the distribution piping systems for educational buildings through the United States, Canada and many foreign countries. These piping systems have proved to be the finest in Thermal efficiency and mechanical strength. Complete information is available on the many types of systems. Write, wire or phone for literature.

***School Executive and Educational Business Magazines annual award for Architectural and Engineering excellence. Linton High School, Schenectady, New York.**

See our catalog in Sweets

Quality Piping Systems . . .
. . . of Exceptionally High Thermal Efficiency
SINCE 1910

RIC-WIL PREFABRICATED INSULATED PIPING SYSTEMS

CENTRAL OFFICE: RIC-WIL INCORPORATED, BARBERTON, OHIO
WESTERN STATES: WESTERN RIC-WIL COMPANY, NEWARK, CALIF.
IN CANADA: THE RIC-WIL COMPANY OF CANADA LIMITED

NEW!

improved

CCVS

SUPERIOR FEATURES

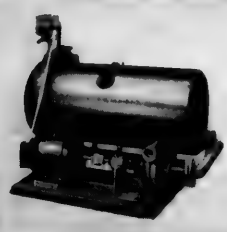
- Vertical close-coupled pump and motor unit bolted to receiver.
- Cast iron receiver for long wear.
- Low return inlets for convenient piping of return close to floor.
- Two receiver inlets on side and top of receiver.
- Stainless steel motor shaft prevents corrosion.
- Quiet operation is proof of vertical pump design.
- Installation on floor level or in pit.
- Mechanical shaft-seal eliminates all leakage from pump shaft.
- No close clearance, efficiency is maintained even at 3500 RPM motor speed.
- Completely assembled ready for return and discharge connections.

There's a wide range of types and capacities for every heating pump need. Let Skidmore advise you on your next tough job.

TYPE UV

Type UV Condensation Pump is designed for below floor level returns, and is built in single and duplex units.

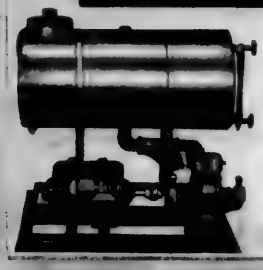
Write for *Bulletin No. 19-A*



TYPE HS

Type HS Pump is recognized for its dependable low operating cost. Capacities range from 1,000 to 65,000 sq. ft. EDR and pressures from 10 to 75 pounds.

Write for *Bulletin No. 14-A*



TYPE TM

Type TM High Pressure Turbine Pump. Designed for pressures up to 150 pounds and boilers to 250 H.P.

Write for *Bulletin No. 17*

Call the nearest Skidmore representative or write for bulletin 21-C.

Representatives in All Principal Cities

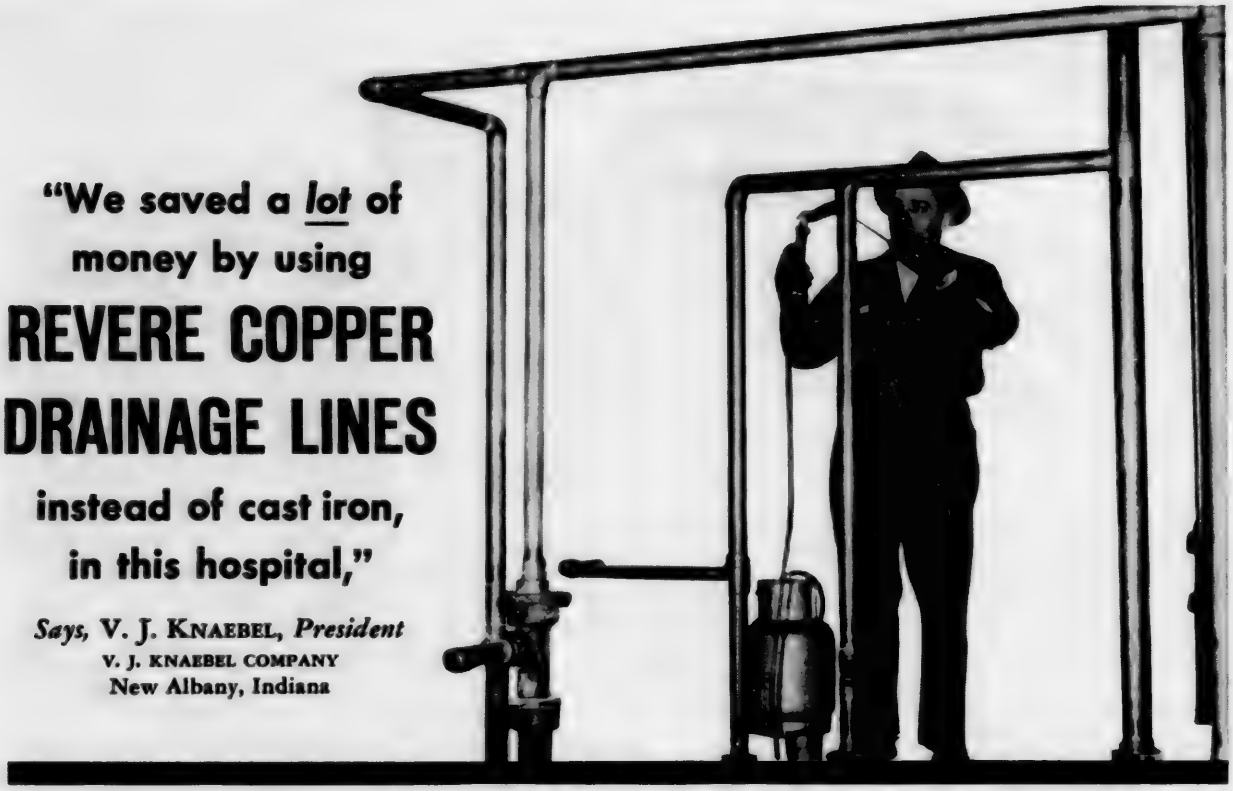
SPECIFY

SKIDMORE PUMPS

SKIDMORE CORPORATION ST. JOSEPH, MICHIGAN

"We saved a *lot* of money by using REVERE COPPER DRAINAGE LINES instead of cast iron, in this hospital,"

Says, V. J. KNAEBEL, *President*
V. J. KNAEBEL COMPANY
New Albany, Indiana



CLARK COUNTY MEMORIAL HOSPITAL, Jeffersonville, Indiana. *Architect:* WALKER, APPLEGATE, OAKES & RITZ, New Albany, Ind. *Engineer:* SOUTHERN ENGINEERING CO., Louisville, Ky. *Gen. Cont.:* JOHN WILE CONSTRUCTION CO., Louisville, Ky.

ROUGHING IN of typical room showing Revere Copper Drainage Lines, Hot-Cold Water and Type "K" Oxygen Lines. 40,000 lbs. of Revere Copper Water Tube were used for drainage lines, oxygen and hot-cold water lines, heating and cooling mains, control lines for room air conditioning units, recirculating water to the cooling tower and other applications.

The original specification on this job called for cast iron drainage lines. When Mr. Knaebel of the V. J. Knaebel Company looked over the specifications, he told the engineer that he would install Revere Type DWV Tube in place of the cast iron at no extra charge. For his past experience has proved to him that a better job can be done, and that a great deal of money could be saved by the use of copper. This is how Mr. Knaebel put it:

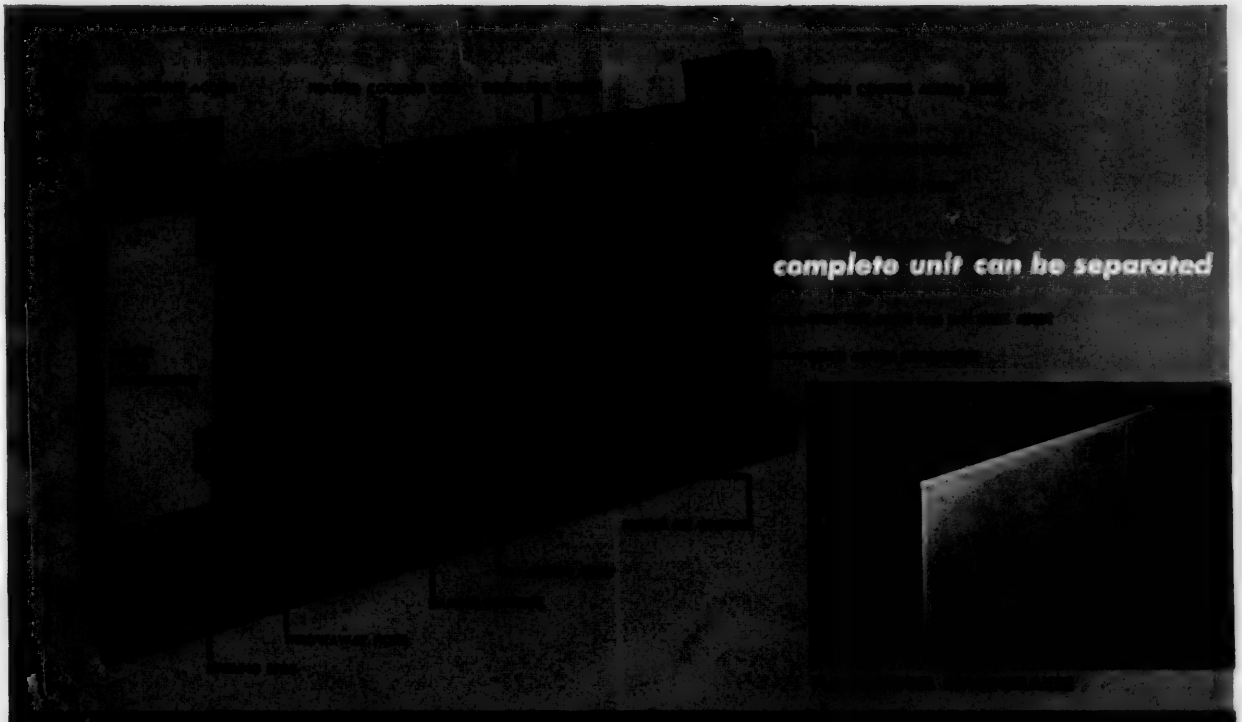
"When you consider the longer lengths of copper drainage lines, how easy it is to solder a joint, the lightness in handling and how you can prefabricate sections in the shop, it's only logical that you can save money by using copper. And, in drainage and waste line use I have yet to hear of any trouble due to clogging.

"Copper water tube is equally efficient and economical when used for hot and cold water lines, air conditioning and oxygen lines, radiant panel heating and other uses. Nothing takes the place of copper water tube for economical, trouble-free performance. And, with the leak-proof joints you can get with copper, coupled with its non-rusting qualities, you seldom, if ever, have to worry about call-backs."

Contractor after contractor will tell you the same thing, "Copper Water Tube costs less to install than rustable materials." For the sake of cost, for the sake of your reputation, specify an all-copper job, using Revere, the oldest name in copper. Your Revere Distributor will fill *all* your needs.

REVERE COPPER AND BRASS INCORPORATED
Founded by Paul Revere in 1801
230 Park Avenue, New York 17, N. Y.

Mills: Rome, N. Y.; Baltimore, Md.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Brooklyn, N. Y.; Newport, Ark.; Ft. Calhoun, Neb. Sales Offices in Principal Cities. Distributors Everywhere.



So Versatile, So Dependable ...and So Easy to Work With

thin-line design
SEASONMAKER

McQuay thin-line design individual room Seasonmakers are popular, not only because of their convenient size, their high efficiency and their inherent quality, but because they are so extremely versatile and dependable. Every part is easily and quickly accessible. They are easy to install and easy to work with. For example, filters are easily changeable; the slide-out fan deck is quickly removable; the hand of coil is easily reversible in the field.

All McQuay Seasonmakers utilize central station heating and cooling and are available with capacities of 220, 330, 440, 520 and 640 cfm. They furnish individual room comfort at any desired temperature level—heated, filtered air in winter and cooled, dehumidified and filtered air in summer. Seasonmakers are ideal for multi-room buildings such as hotels, apartments, motels, schools, hospitals, offices and residences.

If you haven't already done so, investigate McQuay individual room Seasonmakers. For complete information call the McQuay representative in or near your city, or write McQuay, Inc., 1619 Broadway St. N. E., Minneapolis 13, Minnesota.

ONLY 8 1/2" THIN
25 INCHES HIGH
4 Models in 5 Sizes

McQuay INC.
AIR CONDITIONING • HEATING • REFRIGERATION

SOFTITE BY WHEELING

Office efficiency by the sheet!

Everybody from building owner to secretary benefits from air conditioning. They all depend upon you to install an effective system. That's one reason why it'll pay you to use Wheeling SOFTITE Galvanized Sheets in all your ductwork.

That's because SOFTITE works easily and smoothly so duct seams are always tight and right. And SOFTITE's galvanized coating never flakes or peels.

Easy to work . . . long lasting and dependable — no wonder our challenge still stands: *Anything that can be made of steel sheets can be made of Wheeling* SOFTITE *Galvanized Steel Sheets.* Accept our challenge! Try SOFTITE and see for yourself! Wheeling Steel Corporation, Wheeling, West Virginia.

WHEELING STEEL CORPORATION · IT'S WHEELING STEEL! *District Sales Offices at Atlanta, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Houston, New York, Philadelphia, St. Louis, San Francisco, Wheeling*

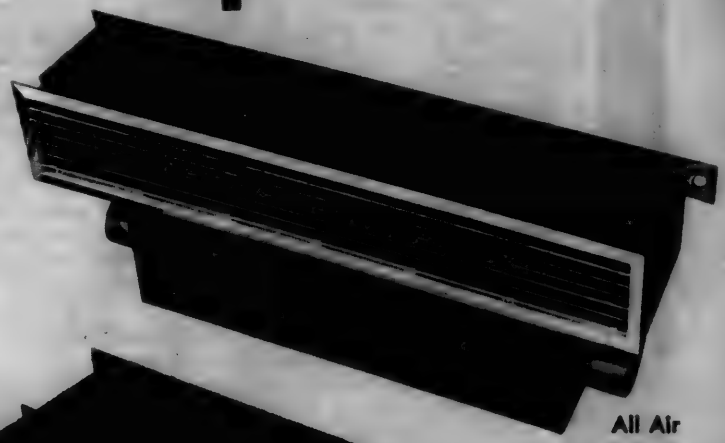
ANEMOSTAT®

is a registered trademark for a wide range of air diffusion equipment

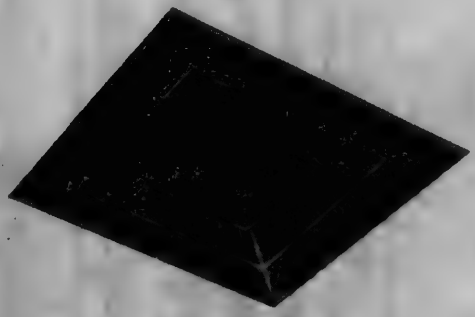
Today Anemostat offers an impressive variety of air diffusion equipment to meet every architectural and engineering requirement. ANEMOSTAT® is a registered trademark. It is your guarantee that every unit bearing this name is of highest quality . . . backed by the most experienced engineering, research and testing laboratories in the industry.

When Anemostat Air Diffusers are in sight the system is right. This was true yesterday, is true today and will be true tomorrow.

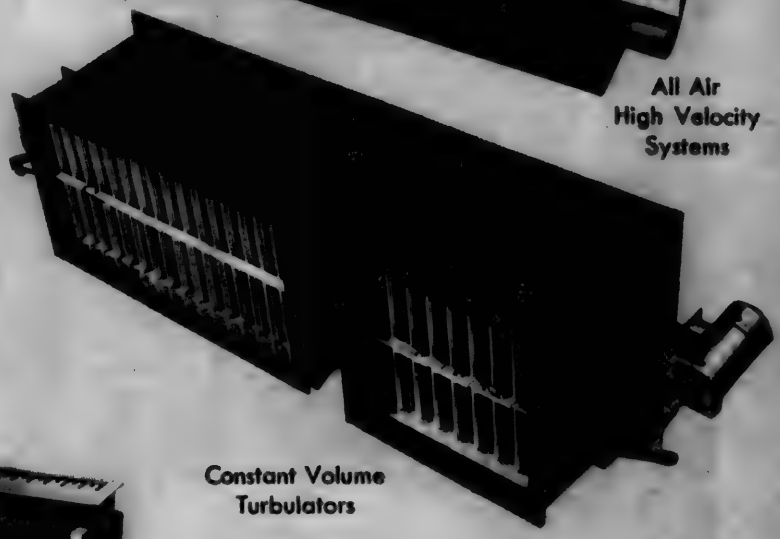
Conventional Air Diffusers



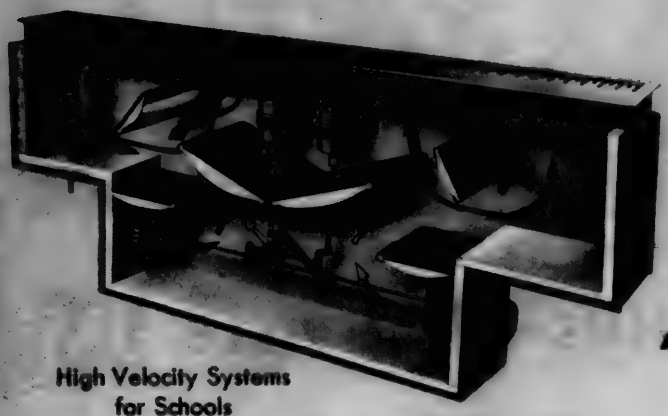
All Air High Velocity Systems



100% Induction Air Diffusers



Constant Volume Turbulators



High Velocity Systems for Schools

ANEMOSTAT.

ANEMOSTAT CORPORATION OF AMERICA

10 EAST 39th STREET, NEW YORK 16, N. Y.

Representatives in principal cities

"No Air Conditioning System Is Better Than Its Air Distribution"

Corrosion-resistant, fireproof vents
...with eye-appeal!

Vertical exposed flues of Transite Vent Pipe form eye-catching design on new Rockwell Manufacturing Co. installation

A GLANCE at this attractive new plant tells you that the material used for the exhaust flues is vital—vital to the plant's appearance . . . vital to maintenance economy.

That's why Walter Wagner & Partners, Architects & Engineers of Fresno, Calif., chose Transite Industrial Vent Pipe to exhaust corrosive fumes from the plant's small parts casting pots.

Made of asbestos-cement, Transite® retains its good appearance through years of weather. *Saves on upkeep*, because it never needs painting or preservative coating. *Saves on maintenance*, because it resists the attack of most gases, mists, fumes, and dusts. Installed indoors or out, Transite offers you these same appearance and maintenance-free advantages.

Transite also offers many layout and installation economies. A wide variety of fittings, diameters and lengths makes it readily adaptable to every venting service. Ease of cutting and handling add further to installation savings.

Let us send you DS-336—a 24-page brochure on Transite Industrial Vent Pipe. Write Johns-Manville, Box 14 HV, New York 16, N. Y. In Canada, Port Credit, Ontario.

Architects & Engineers: Walter Wagner & Partners, Fresno, Calif.
Mechanical Contractor: Robert Wright Plumbing, Porterville, Calif.

New plant at Porterville, Calif., has twenty-two 8" Transite exhaust flues. Joined by 14-gauge metal bands, each flue has clean, unbroken appearance.

JOHNS-MANVILLE

JOHNS-MANVILLE JM PRODUCTS

Handling Hot Fumes? Bifurcate 'em!

A protective housing shields a DEBOTHEZAT Bifurcator® motor from contact with hot and corrosive fumes. Special alloys for housings and fan wheels are available for extremely corrosive fumes. The result: smoother operation and lowered motor maintenance costs. In-the-duct installation of DEBOTHEZAT Bifurcator Fans saves valuable space and ends sharp-corner deflection of exhaust flow. Friction is reduced and velocity increased.

Direct-drive DEBOTHEZAT Bifurcator Fans economize fume removal problems in a wide variety of applications. Contact a DEBOTHEZAT engineer NOW.

De Bothezat® FANS

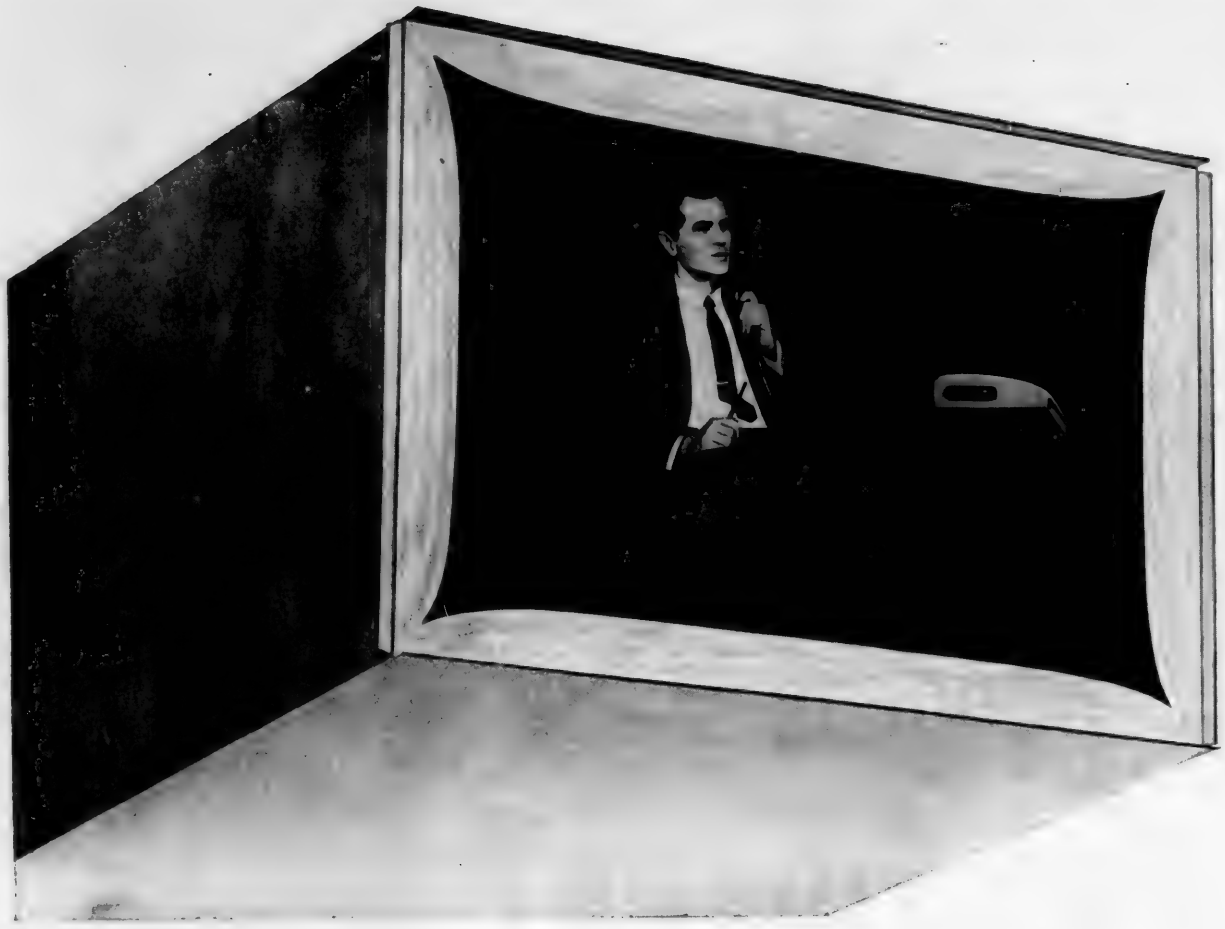
A DIVISION OF

American Machine and Metals, Inc.

EAST MOLINE, ILLINOIS

FOR FURTHER INFORMATION SWEET'S PLANT ENGINEERING FILE OR WRITE FOR COPY

IN CANADA: Represented by DOUGLAS ENGINEERING, LTD., Toronto • Montreal



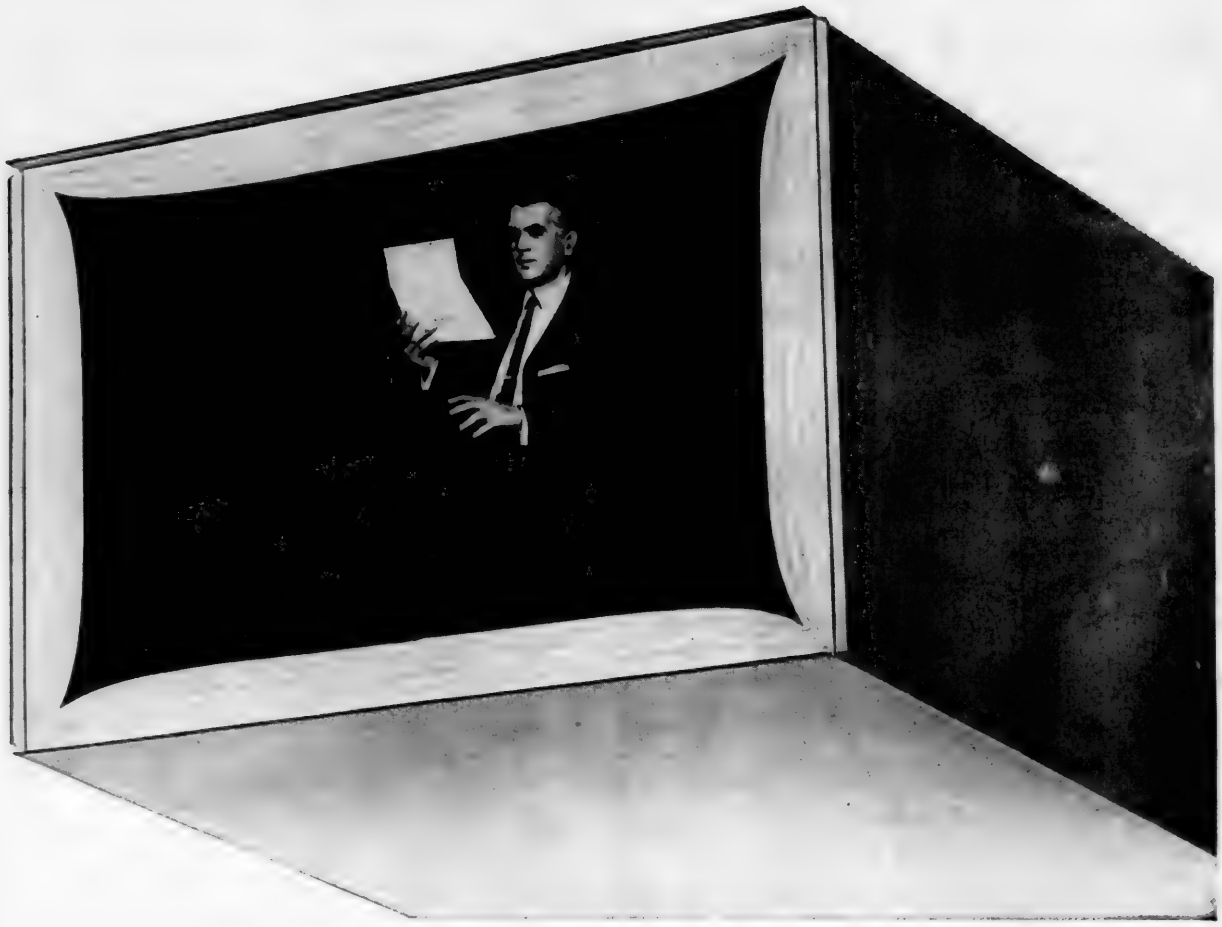
Keeps air ducts quiet . . .

J-M Microtex® fiber glass duct liner does

MICROTEX—
another quality
Johns-Manville
Fiber Glass product

WHY YOUR INSTALLED COSTS ARE LOW WITH JOHNS-MANVILLE MICROTEX . . .

- **LIGHTWEIGHT MATERIAL.** Easy to handle in the shop.
- **RESILIENT.** Can be formed with the metal in the brake.
- **STRONG.** Holds up during shop handling. Won't pull apart. Less waste.
- **EASY TO CUT AND FIT.** Regular shop methods, skills and tools speed fabrication.
- **PLEASANT TO HANDLE.** Workmen like the texture of Microtex.



keeps them efficient, too

both effectively... and at low cost

Thanks to carefully engineered metal air duct systems lined with Johns-Manville Microtex, it's quiet as a country churchyard inside many a modern building. Duct noises from motors, fans and adjacent rooms get into this fiber glass insulation—and never come out again! They're trapped and killed by countless microscopic air pockets formed by the millions of fine glass fibers.

Comfort is increased, too, because temperatures of the cooled or heated air can be more evenly controlled during distribution. This is a result of the high insulating efficiency of Microtex which also reduces power and fuel costs.

Johns-Manville Microtex is a semi-rigid blanket. The fine glass fibers are reinforced with textile yarn and bonded with a thermosetting resin. A black vinyl coating resists erosion even at top air velocities . . . eliminates need for painting inside of ducts in back of grills. Furthermore, with the insulation inside the duct, the sheet metal itself serves as the vapor barrier.

Over-all, Microtex provides maximum insulation value for dollar invested. It reduces installation costs—*see opposite page*. Its inorganic glass fibers are ageless . . . no danger of loss from rot, decay, moisture or vermin.

For specification and installation data on high-efficiency, low-cost Microtex, contact your nearby Johns-Manville representative. Or write to Johns-Manville, Box 14, N. Y. 16, N. Y. In Canada, Port Credit, Ont.

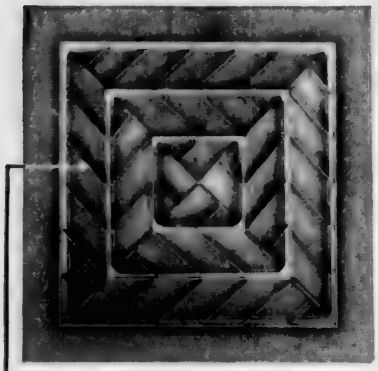
JOHNS-MANVILLE JOHNS-MANVILLE JM PRODUCTS

it's what's inside that counts!

AGITAIR® air diffusers

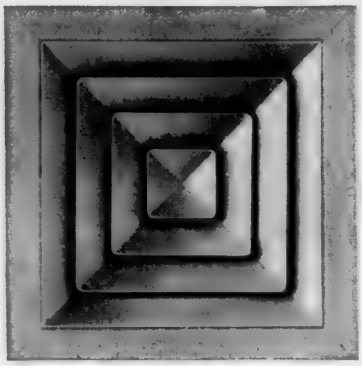
WITH BUILT-IN DIFFUSING VANES CONTROL EVERY CUBIC FOOT OF AIR IN ANY ENCLOSURE

AGITAIR Diffuser



These AGITAIR DIFFUSING VANES provide 64 active air jets to every square foot of the diffuser.

Most Copied Design



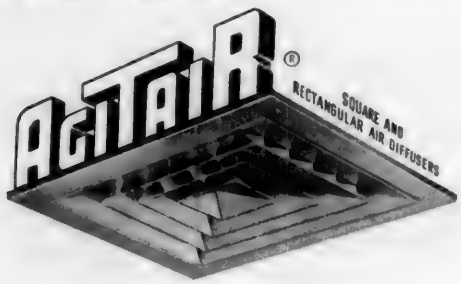
AGITAIR originated square and rectangular designed diffusers.

AGITAIR unequaled performance efficiency ...job-proven more than 1,000,000 times

Air Devices Inc., engineers designed, developed and pioneered the application of AGITAIR square, rectangular air outlets with built-in diffusing vanes to replace the use of unpredictable air distribution from vaneless plaques.

Today, more than 1,000,000 AGITAIR custom-made square and rectangular diffusers are installed on thousands of applications in all kinds of business.

AGITAIR diffusers provide 100% draftless air distribution from any location in the ceiling or sidewall with blows in 1, 2, 3 or 4 directions and with no stagnant areas in the conditioned spaces. No blank offs.



The vane and louvre construction of AGITAIR square and rectangular air diffusers produces counter-flowing air streams or jets (64 to a square foot). This action induces movement of all room air toward the diffuser while rapidly mixing the conditioned air with room air to assure instantaneous temperature equalization and draftless distribution. Plaques are incapable of performing these basic functions.

Every feature of these AGITAIR diffusers has been designed to assure complete users satisfaction. Appearance . . . performance . . . noiseless . . . draftless air distribution. For complete engineering data on these AGITAIR custom-made diffusers ask your local AGITAIR representative or write direct to Air Devices Inc.

air diffusers • filters • exhausters
registers and grilles

AIR DEVICES INC.
185 MADISON AVENUE, New York 16, N. Y.

McDONNELL
Flow Switches

FS4 Series Flow Switch Mounted in a 2 inch Tee

Do you know how many jobs these switches can do?

Look at the FS4 Series Flow Switch illustrated here. What you see is a compact, well-built switch that either makes or breaks a circuit (as required) when liquid flows or stops flowing. Yet in this versatile device you have both the most economical way and the most positive way of starting or stopping a signal, an alarm, a motor, a metering device—anything electrically operated. Just to highlight a few uses:—

to actuate a signal light—signal an attendant to make the right moves in operating valves, pumps and the like—signal him when flow stops in a water cooled compressor, water cooled bearing and so on.

to sound an alarm—when flow stops in a process system or in any water cooled devices.

to start or stop motors—start pumps in sequence in multiple stage flow systems; start standby pumps; stop automatically controlled units if cooling water system fails; stop compressors in cooling systems when flow stops. These are *control* functions, and almost endless.

to start or stop automatic burners—start a booster heater when water draw occurs; stop burner if flow is improperly retarded; make sure of circulation in a boiler before burner is permitted to start.

to actuate metering device—open valve in chemical feeder line; start mixing in secondary line whenever flow starts in primary line.

Think it over! Some of these uses may suggest some related problem the FS4 can solve for you right now. Notice the facts about its construction and service range opposite.

McDONNELL & MILLER, *Inc.*, 3500 N. Spaulding Ave., Chicago 18, Ill.

Doing One Thing Well

Coupon brings bulletin

It covers design, construction, electrical ratings and dimensions. Points out many typical applications.

Please send me a copy of Flow Switch Bulletin FS1.

COMPANY _____

ADDRESS _____

CITY, ZONE, STATE _____

BY _____

Mail to: McDonnell & Miller, Inc., 3500 N. Spaulding Ave., Chicago 18, Illinois

McDonnell quality throughout:

Compact switch with positive snap action. Removable cover and two knockouts for easy wiring. Phosphor bronze sylphon seals assembly leak-tight from line. Paddle made in segments to fit any pipe from 1" through 3". FS4 series, illustrated, is for maximum working pressure 100 psi; maximum temperature, 300° F., in types as follows:

FS4-3 Single pole, double throw switch. Opens and closes two separate circuits with flow. Closes and opens same two circuits with no flow.

FS4 Closes with flow, opens with no flow.

FS4R Opens with flow, closes with no flow.

Underwriters' Listed

● Model E-2 available for larger pipe sizes and pressures to 150 psi.

You get these benefits when you install YARWAY GUN-PAKT EXPANSION JOINTS

Why do industrial plants, institutions, universities and central heating plants SPECIFY and INSTALL Yarway Gun-Pakt Expansion Joints?

Because with Yarway you get:

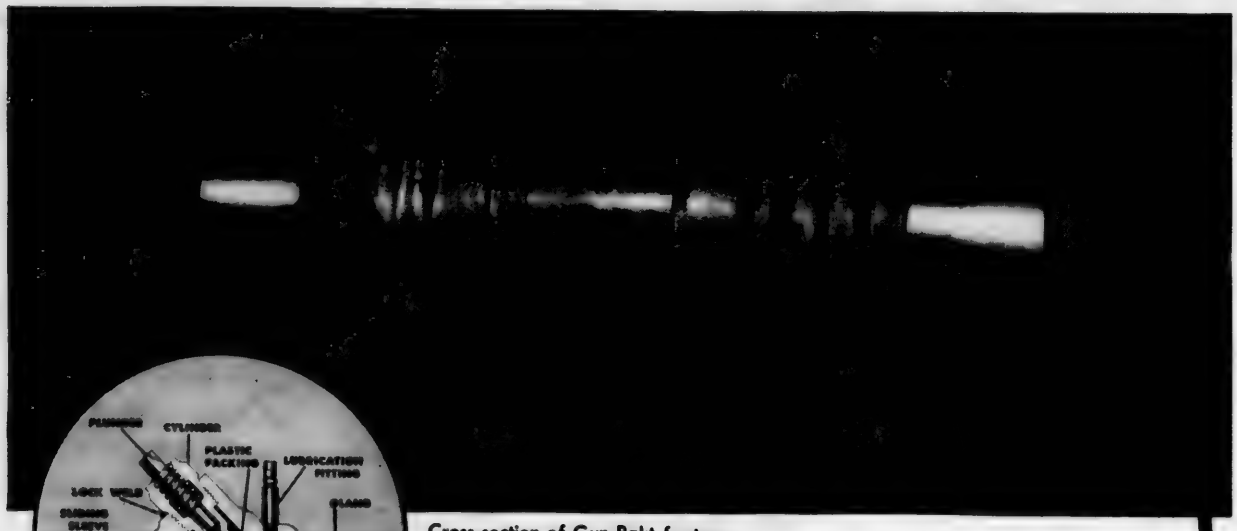
- **CONTINUOUS SERVICE**
  Costly shutdowns are eliminated. Packing is seldom necessary but may be added *under full line pressure*. No vents are necessary. Never needs repacking.
- **RUGGED DEPENDABILITY ALL STEEL CONSTRUCTION**
  Durable chromium plated seamless steel sleeves. No chance *of metal fatigue*. Wrought steel bases provide rugged, positive anchorage.
- **INTERNAL AND EXTERNAL GUIDES**
  Positive alignment of sleeve in stuffing box *—where it counts!*
- **LIGHT WEIGHT, STREAMLINED DESIGN**
  Requires less space to install—less space to maintain—smaller manholes.

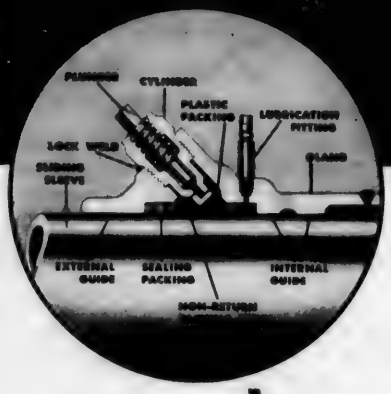
Many Gun-Pakt joints have been *in service over 25 years with only nominal maintenance*—no major repairs or periodic overhauls. Maintenance costs are negligible—records show average to be one manhour and 65 cents worth of packing per joint per year. AND—NEVER A SHUTDOWN FOR REPACKING!

YARWAY field engineers are qualified to advise on installation and service—at no cost to you. Investigate today. Write for Bulletin EJ 1917 ('59).

FOR YOUR NEXT PIPELINE JOB—BE SAFE—BE SURE! SPECIFY YARWAY GUN-PAKT.

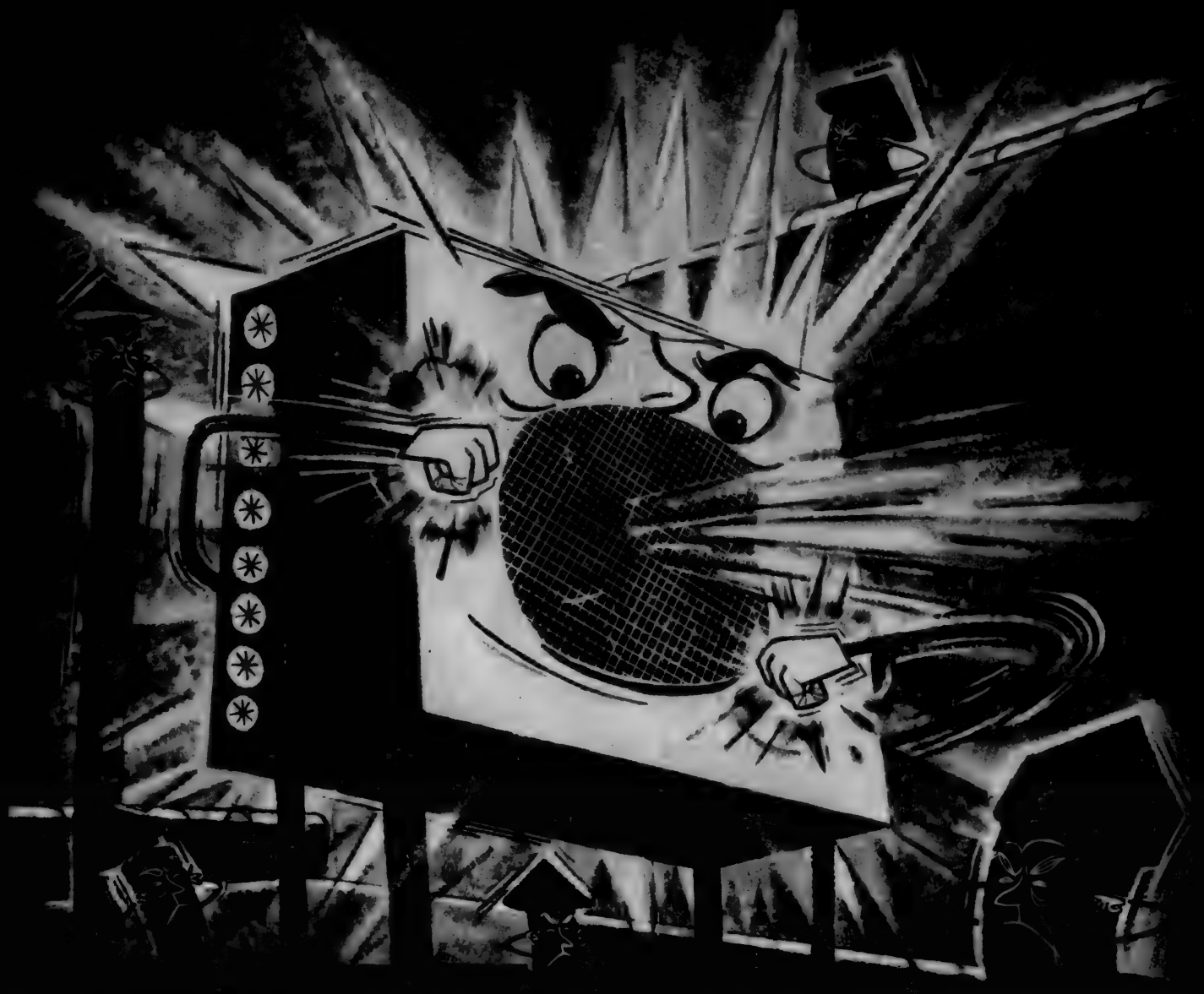
YARNALL-WARING COMPANY
104 Mermaid Avenue, Philadelphia 18, Pa.
BRANCH OFFICES IN PRINCIPAL CITIES





Cross-section of Gun-Pakt feature. To add packing, just insert a plug and turn the plunger. Note non-return packing slots.

YARWAY GUN-PAKT



BEFORE YOU BUY, THINK:

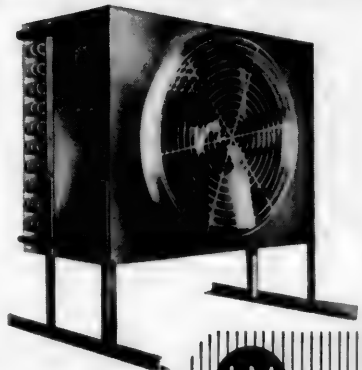
Will your air-cooled condensers sound like thunder?

Not even from close up if they're by Halstead & Mitchell

Fan noise, vibration and rattling have been engineered out of H&M air-cooled condensers. Deep pitch fans are run at slow speeds. Casings are rugged; won't loosen with use.

H&M condensers are completely dependable. The large coil and exclusive Turbu-Flo fins improve heat transfer by up to 15%. Fins are spaced widely to avoid clogging by dirt and other air-borne particles.

Winter operation is easy, too, with H&M's special modulating valve. Halstead & Mitchell air-cooled condensers are available in propeller fan or blower models. Multiple circuiting at no extra cost. Ask your local distributor for complete information, or write to Halstead & Mitchell, Bessemer Building, Pittsburgh 22, Pa.



H&M AIR-COOLED CONDENSER

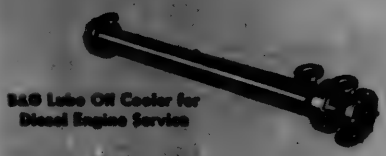
HM

Halstead & Mitchell

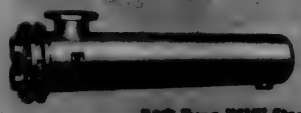
Water-Cooled Condensers · Cooling Towers · Air-Cooled Condensers · Finned Coil Products

SYMBOL OF QUALITY

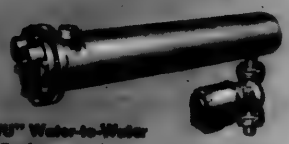
B&G Evaporators and Condensers



B&G Lube Oil Cooler for Diesel Engine Service



B&G Type "SU" Steam-to-Water Heat Exchanger



B&G Type "WU" Water-to-Water Heat Exchanger

For heating or cooling liquids or gases, all B&G Heat Exchangers are built to A.S.M.E. Code requirements

B&G Heat Exchangers are not only engineered to top efficiency but are constructed to the uncompromising standards of quality and safety demanded by the A.S.M.E. Code.

With each B&G Exchanger, a Manufacturer's Data Report for Unfired Pressure Vessels, Form No. U-1, as required by the A.S.M.E. Code rules, is furnished. This form is signed by a qualified inspector, holding a National Board Commission, certifying that the construction conforms to the latest A.S.M.E. Code for unfired pressure vessels. The A.S.M.E. "U" symbol is stamped on each exchanger.

All facilities required for heat exchanger manufacture are available under one roof at B&G, where assembly line procedures permit building an inventory of stock items. Many of the machining, tooling and welding fixtures are especially designed by B&G. All welding procedures must satisfy A.S.M.E. standards...and all welding is spot X-rayed.

B&G Heat Exchangers are manufactured by methods which hold shell diameters exact and free of distortion. This permits tight fitting baffles with minimum liquid slippage and easy replacement of tube bundles if ever necessary.

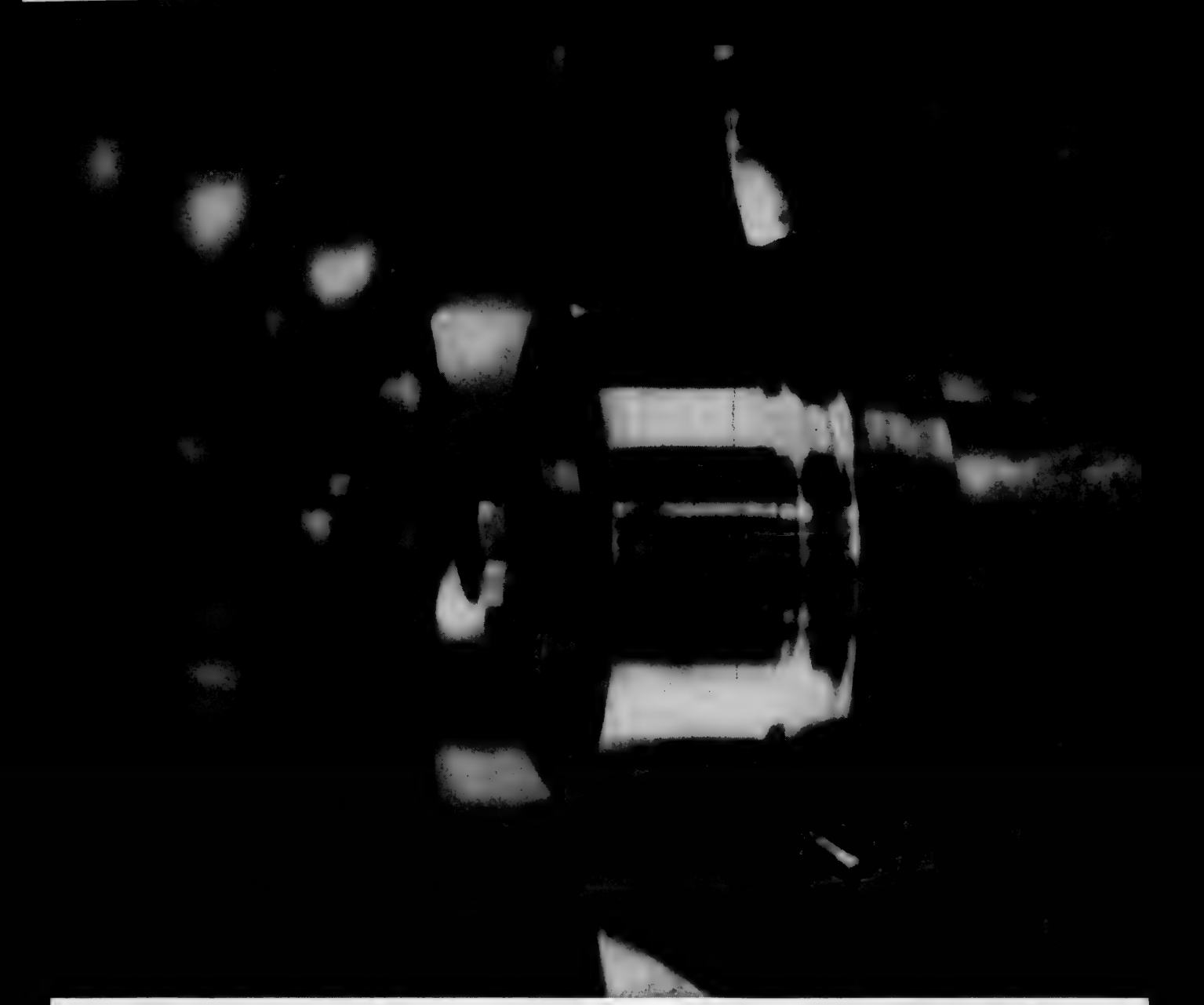
Send for free brochure, "The A.S.M.E. Story."

B&G Heat Exchangers are welded in specially designed fixtures by expert workmen.

BELL & GOSSETT
COMPANY

Dept. FZ-4, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong Ltd., 1400 O'Connor Drive, Toronto 16, Ontario



"LOCK SEAMS GIVE US TROUBLE? NO SIR—WE USE WEIRKOTE!"

When it comes to the rigors of lock-seaming, nothing can take it like Weirkote.

Why? Because Weirkote combines the strength of steel with a tightly bonded continuous process zinc coating that remains intact through the severest fabricating steps. No chipping. No peeling. In fact, Weirkote can be worked to the very limits of the steel itself and still come through with a smooth, even, corrosion-resistant zinc coating on both sides of every crease.

So whether your product is crimped or drawn, spun or twisted, Weirkote means a new high in production results, corrosion prevention and customer goodwill—a new low in costly, worrisome rejects.

Weirkote's low initial price, combined with these production savings, insures the economical quality you may have been looking for. Why not investigate further by sending for the 12-page Weirkote booklet that explains how Weirkote can help you both in your products and in your production. Just write to Weirton Steel Company, Dept. N-13, Weirton, West Virginia.

WEIRTON STEEL COMPANY

WEIRTON STEEL COMPANY

WEIRTON, WEST VIRGINIA

a division of

NATIONAL STEEL CORPORATION

THIS COUPON WILL LEAD TO PROFITS!

Forge & Fittings Division, H. K. Porter Company, Inc., P. O. Box 95, Roselle, New Jersey
Please send me full literature on your new *Fishmouth*

NAME..... TITLE.....

COMPANY.....

ADDRESS.....

CITY..... ZONE..... STATE.....

You've Got The Job! Here's How to Make It Profitable!

NEW W-S FISHMOUTH BRANCH FITTINGS

Typical Cost: Only 81¢ for 2 inch size for run pipe to 36 inches!

You bid for the job. Stayed late nights to get your bid low. Now the job is yours. But—where's the profit? You have to squeeze on materials and time to make it. Buy cheap—work fast. The old story.

But here's a new story. Figure your branch connections. Lots of them on every job. This new product, W-S FISHMOUTH—figure it instead of the usual tees, laterals, crosses. Savings are almost unbelievable. Makes the difference between breaking even and getting a profit.

If you send us the coupon, you'll learn more. We'll send a 16-page booklet. Tells the whole story. Shows costs for FISHMOUTH vs. other branch connections.

FORGE AND FITTINGS DIVISION PORTER **H.K. PORTER COMPANY, INC.**

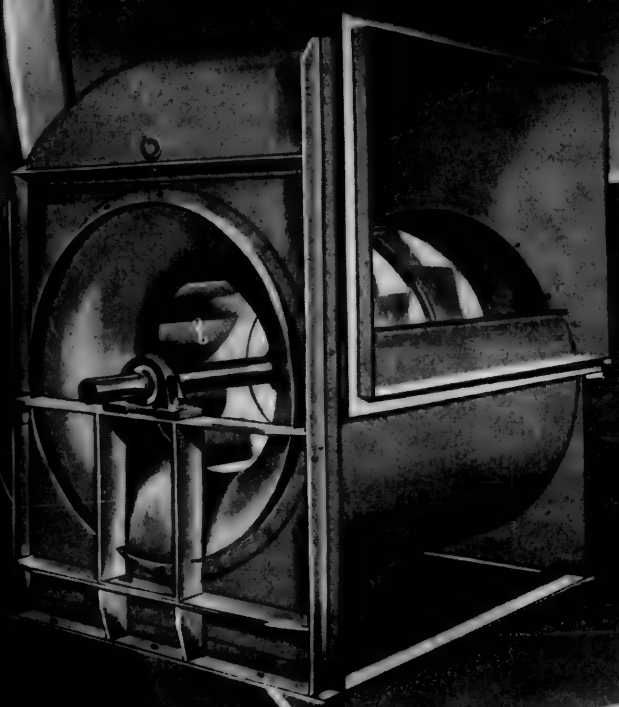
PORTER SERVES INDUSTRY: with Rubber and Friction Products—THERMOID DIVISION; Electrical Equipment—DELTA-STAR ELECTRIC DIVISION, NATIONAL ELECTRIC DIVISION; Specialty Alloys—RIVERSIDE-ALLOY METAL DIVISION; Refractories—REFRACTORIES DIVISION; Electric Furnace Steel—CONNORS STEEL DIVISION, VULCAN-KIDD STEEL DIVISION; Fabricated Products—DISSTON DIVISION, FORGE AND FITTINGS DIVISION, LESCHEN WIRE ROPE DIVISION, MOULDINGS DIVISION, H. K. PORTER COMPANY de MEXICO S. A.; and in Canada, Refractories, "Disston" Tools, "Federal" Wires and Cables, "Nepcoduct" Systems—H. K. PORTER COMPANY (CANADA) LTD.

AcoustaFan

eaturing the

Flow-Nozzle Air Foil W

f QUIET

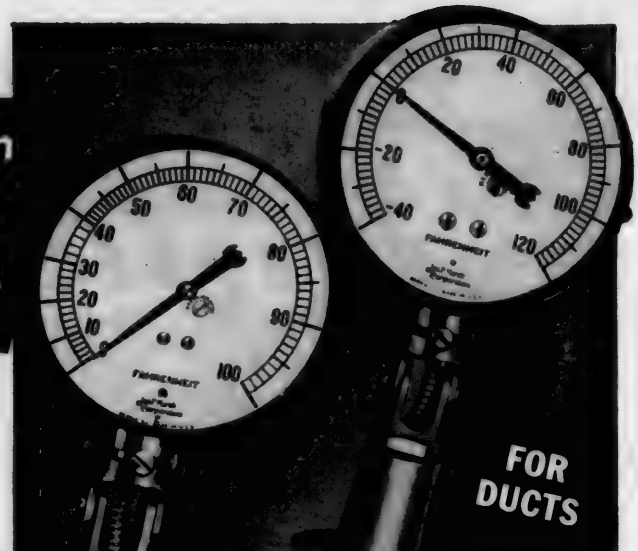


nyb

MPANY

For the first time!

Everything you need in Dial Thermometers for Piping and Duct work!



A new and complete line of instruments: Dial thermometer of Marsh precision and accuracy designed down to the last detail for piping and duct work . . . for use on heating and cooling equipment, air ducts, vessels and kilns, ovens and similar applications.

Easier to read

Illustrations tell the story. Four types, seven ranges—72 stock combinations to meet every condition. Big, legible 3½" and 4½" dials . . . easy to read in places where piping and duct thermometers must be installed. Ease of reading further increased by provision for tilting and turning dials to any desired reading angle. Line includes distant reading types that take care of remote locations.

Unbreakable—more accurate

Instead of fragile difficult-to-read glass tube thermometers you now have sturdy, unbreakable, legible Marsh Dial Thermometers. Guaranteed accurate to plus or minus one division of the scale, they have far greater *readable* accuracy than any glass tube type. All have the famous Marsh "Recalibrator"—to *keep* them accurate.

All purpose

Design provides for every on-the-job condition. Separable sockets ("wells") simplify installation—or removal for servicing. Extension necks take care of insulation on piping or ducts. Long stems in duct type put temperature-sensitive section where it belongs.

Note the brief specifications opposite. Any thermometer is available from stock.

Write for bulletin telling the whole story.

Marsh Instrument Company
Division of Colorado Oil and Gas Corporation
Dept. U, Skokie, Ill.
Marsh Instrument & Valve Co. (Canada) Ltd.
8407 103rd Street, Edmonton, Alberta

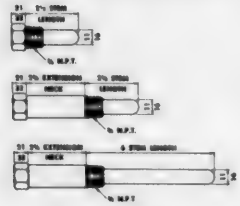
FOR PIPING

For piping

Dial sizes: 3½" and 4½"

Ranges:
0° to 100°F for chilled water
20° to 120°F for condenser water
40° to 240°F and 100° to 300° for hot water and domestic water
¾" NPT connection

All ranges, in both direct mounted and remote reading types, available with three standard sockets shown in drawing below.

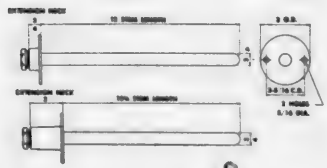


For ducts

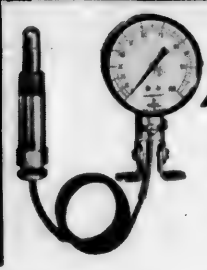
Dial sizes: 3½" and 4½"

Ranges: −40° to +120° F
0° to 160° F
0° to 220° F

All ranges, in both direct mounted and remote reading types, available with standard extension necks and stems shown in drawing below.

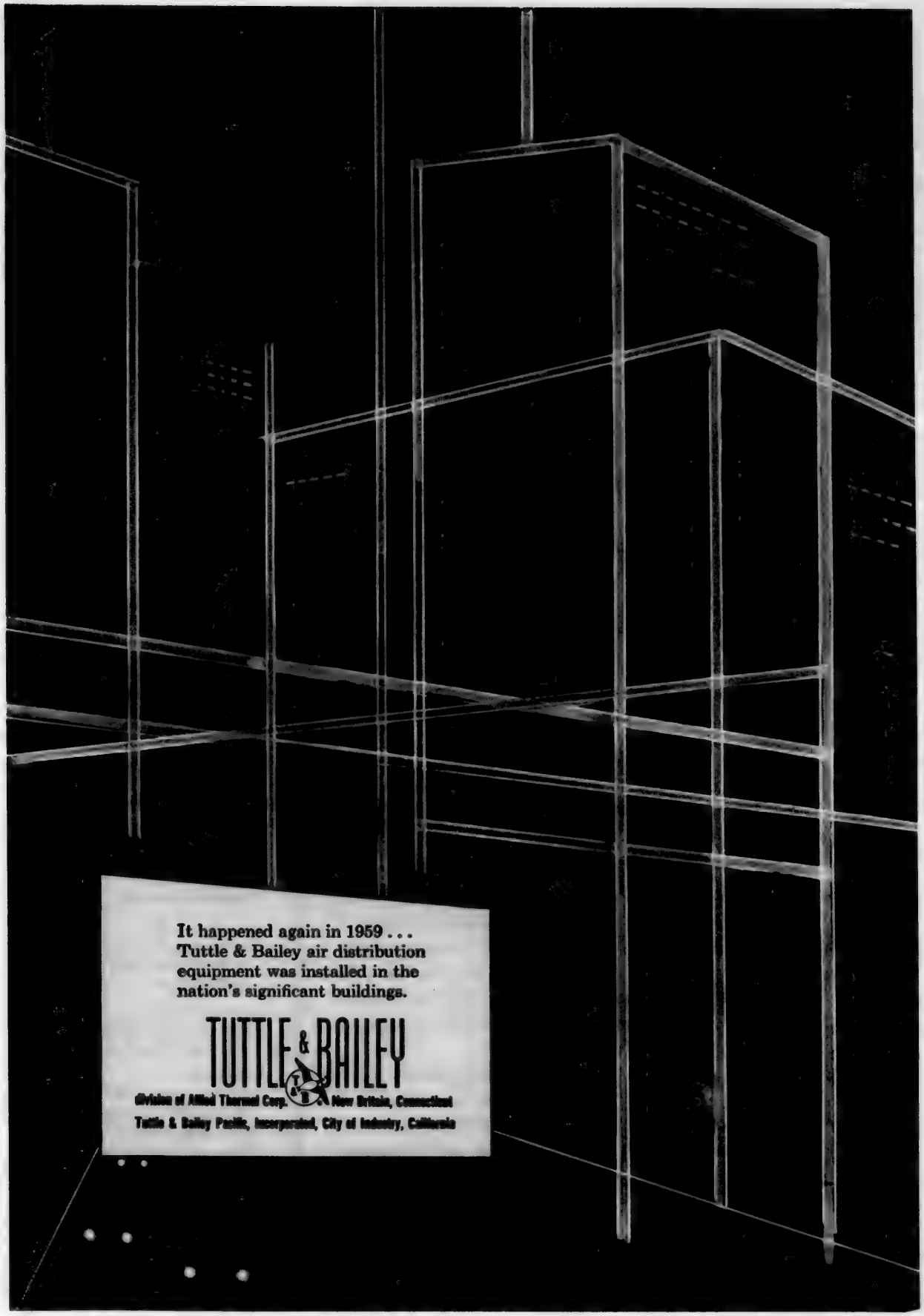


MARSH
DIAL THERMOMETERS

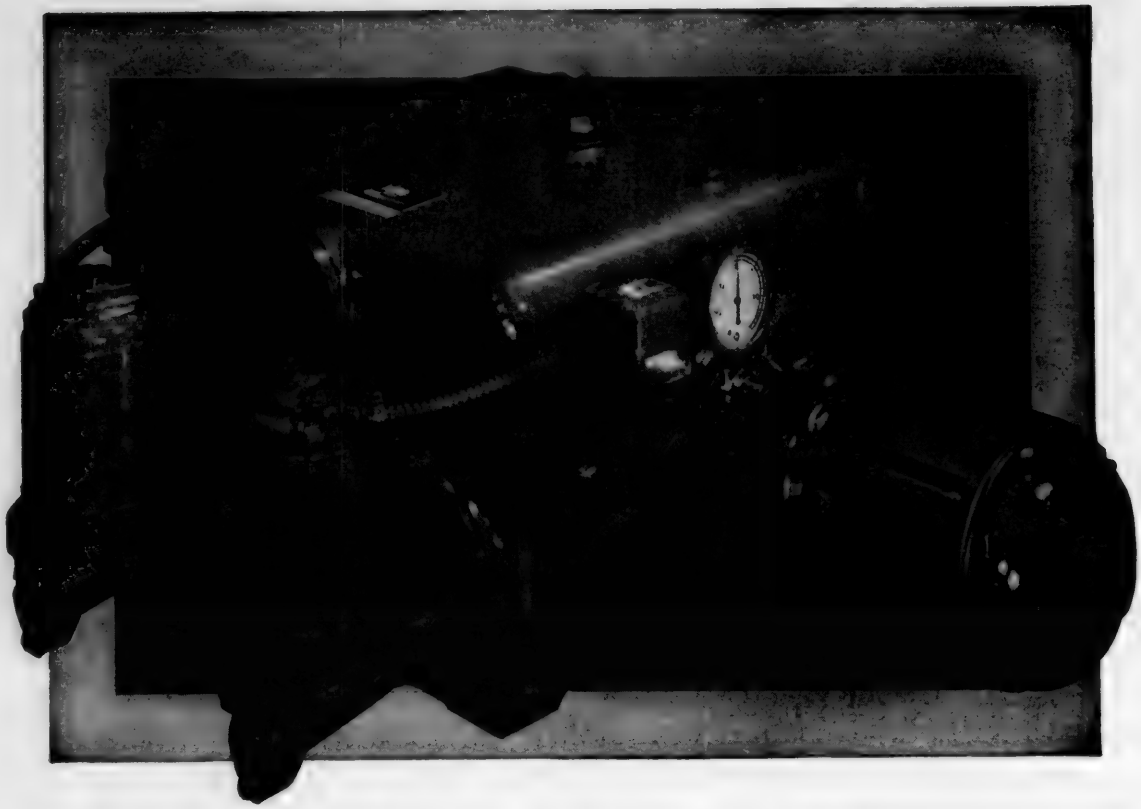


Also remote reading—

Piping and duct thermometers of same basic design available with 6 ft. of capillary tubing as shown.


It happened again in 1959 . . .
Tuttle & Bailey air distribution
equipment was installed in the
nation's significant buildings.
TUTTLE & BAILEY
Division of Allied Thermal Corp. New Britain, Connecticut
Tuttle & Bailey Pacific, Incorporated, City of Industry, California

THIS NEW VACUUM HEATING PUMP IS SIZED TO ACTUAL JOB REQUIREMENTS



It's the Nash CSM

No longer is it necessary for the Engineer to accept a vacuum heating pump with air and water capacities based inflexibly upon square feet of equivalent direct radiation. With the flexible Nash CSM he can provide for proper air capacity in accordance with his judgment and experience. For the individual capacities of the separate pumps on the CSM may be varied within a wide range, without buying an oversize receiver and oversize water pumps.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low, returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- Increased air capacity induces rapid system response without wasteful overheating.
- Separate air and water pumps individually selected to meet actual job requirements.
- Control system that operates individual pumps only when needed.
- Flexibility permitting addition of radiation without changing basic pump installation.
- Low, low, return line connection.

NASH ENGINEERING COMPANY
438 WILSON, SO. NORWALK, CONN.

Proof room of a bakery showing radiant ceiling with diffusers and the troughs of fermenting sponge.

Air Conditioning and Refrigeration Are Important Factors in Properly

Automating a Modern Bakery

GEORGE G. SWANSON
Mechanical Utilities Division, Engineering Department,
National Biscuit Company, New York, N. Y.

Automatic machinery is widely used in the cookie and cracker baking industry. High speed production lines depend upon well designed air conditioning and refrigeration systems. Information is presented on design conditions that must be maintained for storage, baking, icing, cooling and packaging operations.

DURING the past decade, the cookie and cracker baking industry has undergone a startling change in manufacturing methods. This is the revolution of automation, which has substantially increased the pounds of product produced per man-hour. In this process, the art of baking has been changed to the science of baking.

Air conditioning and refrigeration have played a most vital part in bringing about the development of the high speed production lines that are found in today's modern bakery. To understand this role, one must first look at a new bakery, such as the National Biscuit Company bakery at Fairlawn, N. J. Here the manufacturing operation may be considered to consist of six phases. These are: raw material storage; mixing of dough; baking; icing; packaging and shipping.

Manufacturing Steps

The operation is begun by the selection of a cookie or cracker formula on a master control console which may be likened to a complex electronic brain. The raw materials, consisting mainly of flour, water, shortening, sugar and other ingredients are automatically withdrawn, weighed and then conveyed to huge mixers which can blend these materials in batches up to 1500 lbs at a time. The dough is then fed to machines which rolls it into a sheet approximately 1/16 inch thick and a yard wide, after which it is cut in the shape of the individual cookies or crackers. These cookies are fed to the traveling band ovens where they are baked under automatic control from 3 to 7 minutes along the 300 ft length of travel. The cookies or crackers then pass through post-conditioning chambers which adjust moisture content, and then on to the icing and packaging areas. Finally the finished cookies and crackers are wrapped in cellophane or wax paper and are packaged, bundled and conveyed to the shipping department. From here they are sent by rail or truck to the consumer market.

The complete operation—from the selection of ingredients to final packaging—is done automatically, in a straight line approximately 800 ft long, taking about 20 minutes, and at a rate of about 500,000 pieces per hour. A modern bakery may contain from 6 to 12 of these lines. It is immediately evident that the temperature and moisture content of both the raw materials and the baked product must be closely controlled to maintain this high speed rate of automatic production, and still retain consistently uniform quality, day after day. This is the important task of quality control that is assigned to air conditioning and refrigeration.

Raw Material Storage

Refrigerated storage rooms are provided for perishable ingredients and for the wax paper used for packaging. These rooms are constructed of aluminum clad, exterior plywood on 2 x 4-inch studding, with the aluminum facing on the exterior and interior of the rooms.

George G. Swanson received a B.M.E. from Cornell University. He joined Carrier Corp. in 1944 and he worked as an application engineer on various assignments in the United States and in Mexico. From 1950 to 1952 he was with H. K. Ferguson, contractors and engineers, New York. He joined the engineering department of the National Biscuit Company in 1952 in charge of heating, ventilating and refrigeration. He is a licensed professional engineer (Illinois) and a member of ASHRAE.

Insulation is contained between the plywood walls. This makes for a sanitary, good looking room, easily kept clean, and the aluminum facing makes an excellent vapor barrier.

One storage room is kept at 34 deg F for the more perishable ingredients which are usually butter, margarine, nutmeats, seeds such as sesame and carroway, cherries and other fruits, and yeast.

A second room is kept at 50 deg for the storage of such materials as: Hydrogenated vegetable oil, cocoa powder, chocolate liquor, malt extract, powdered milk, grated cocoanut, chocolate drops and various flavoring agents and spices.

The wax paper cool room is kept at 55 deg to keep the paper at the proper condition where it will unroll without sticking or tearing in the automatic packaging machines.

Each room is refrigerated by ceiling-suspended unit coolers served by an individual condensing unit.

Mixing Department Refrigeration

The machining of dough is influenced by several factors, of which dough temperature is one of the most important, since it is indirectly an index of consistency. To reach the proper dough temperature at the completion of a mix, ice water is supplied for the ingredient water and the jacket of the mixer may be refrigerated. This is done to offset the higher temperature of the flour and shortening and also the heat generated by the mechanical work of mixing.

The ingredient ice water system is served by a central unit consisting of a stainless steel plate cooler with a stainless steel storage tank of about 600 gal capacity. The water in the tank is kept at 34 deg by recirculation over refrigerated plates. A separate piping system and pump conveys this water to the weigh tanks where it may be blended with city water automatically or used at 34 deg depending on the formula requirements for the particular cookie or cracker dough being mixed.

Cooling of mixer jacket water is accomplished by circulating the water through a shell and tube chiller where the water is cooled to 40 deg and is then pumped to the mixers. Here, again, it may be blended with city water or used at 40 deg depending on the setting of the automatic temperature control for the dough being mixed.

To prevent the sticking of certain doughs to the rolls of the sheeting machines which roll it to a precise thickness, the rolls are supplied with cold water at 45 deg. This water is recirculated through a piping system to a shell and tube chiller at a central location.

Cracker Sponge Proof Room

The soda cracker or saltine is produced in greater volume than any other single cookie or cracker in a bakery. The preparation of the fermented sponge, as the mixture of flour, water and yeast is known in the trade, is perhaps the most critical of all the bakery's operations. It may seem odd that the soda cracker which is the cheapest item is the most difficult to produce.

The process begins with the flour-water-yeast and buffer (lactic acid producing organisms) mixture being deposited in large stainless steel clad tubs on wheels called troughs. The troughs are wheeled into an air conditioned room, called a proof room, where they remain for about 18 hours while the mixture ferments or proofs. During this period, the yeast cells multiply, producing carbon dioxide bubbles which raises the sponge to within a few inches of the lip of the trough. More flour is added along with shortening and this mixture, known as a dough, is allowed to proof another 4 hours. After this, the mixture is conveyed to the sheeting machines and then cut and baked. The action of the fermentation is to break down the flour and develop the gluten so that the final baked cracker is flaky and has a tender "bite" that is not found in the unleavened cracker. The process is similar to bread making which is so familiar to housewives.

The proof room must be held at 80 deg D.B. and 75% R.H. Air motion at the three-foot level must be below 30 fpm. Temperatures higher than this will accelerate the fermentation, causing uneven quality and crusting of the sponge surface. Too low a temperature will inhibit the proofing with the result, that the sponge will be underdeveloped. Humidity control is also very critical since low humidities will dry out the sponge surface causing heavy crusting. Too high a humidity will cause wet, slimy surfaces which are also undesirable.

Crusting of the surface forms a dense, impenetrable barrier for the release of carbon dioxide and moisture vapor, and will act to retard further fermentation. The heavy crust will also make sheeting of the final dough next to impossible.

Under proper conditions, the released carbon dioxide and water vapor reaches a state of equilibrium at the surface of the sponge. This may be likened to a cloud or a fog blanket which hangs over the surface up to the lip of the trough. This blanket acts as a protective cover to keep the sponge surface at the required condition. A low humidity will quickly absorb this cloud and a crust will form. However, any air motion over 25 fpm at the trough level, will have an even more drastic effect. The high air motion acts to scrub the protective cloud blanket away and will remove the exuding moisture faster than it is formed. The result is a heavy and deep crust and a retarded sponge. The problem of undue air motion is a bugaboo in proof room air conditioning and operation.

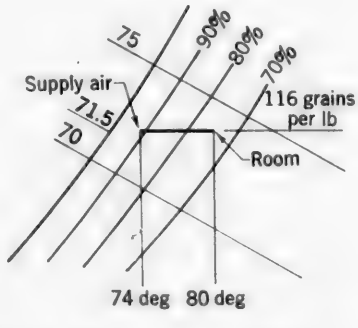
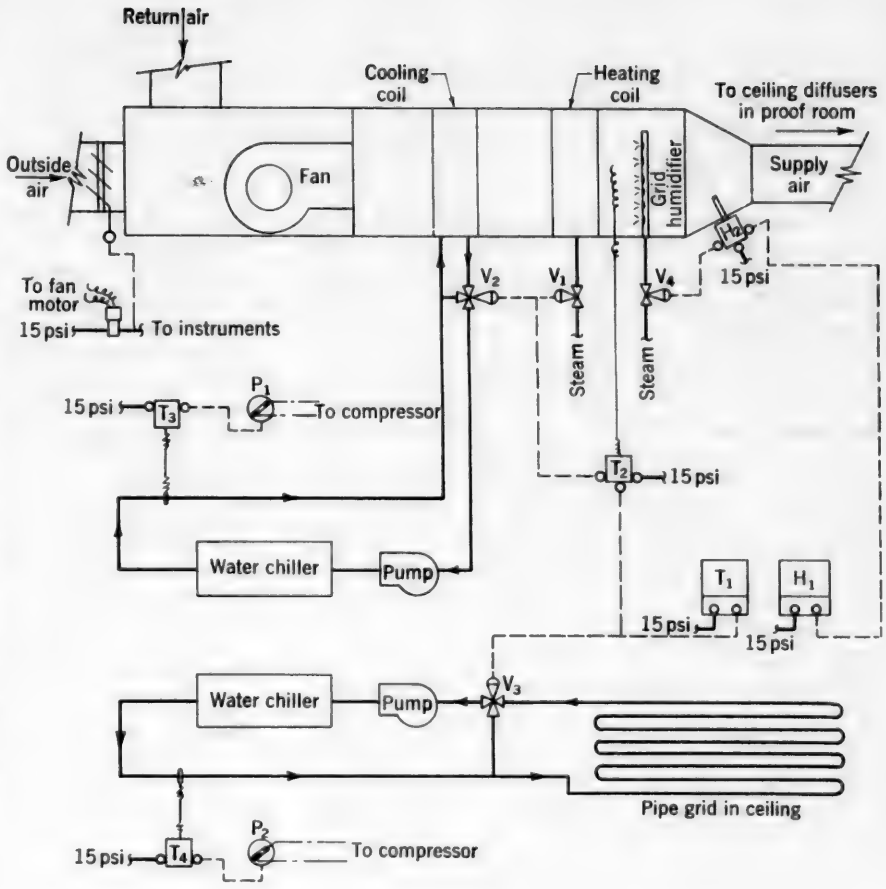


Fig. 1. Psychrometric chart for a design problem.

Fig. 2. Proof room conditioning system.

T_1—Room electronic humidistat with convertor, direct acting, set at 80 deg.
T_2—Submaster thermostat, direct acting, reset by T_1 to control valves V_1 and V_3 in sequence, 60-85 deg.
T_3—Thermostat, reverse acting to control compressor serving chiller for air unit. Set at 60 deg.
T_4—Thermostat, reverse acting to control compressor serving chiller for ceiling unit. Set at 72 deg.
H_1—Room electronic humidistat with convertor reverse acting. Set at 75% R.H.
H_2—Duct submaster thermostat reverse acting, reset by H_1 to control humidification.
V_1—Normally open steam valve, spring range 4-8 psi.
V_2—Three-way water valve, normally closed to coil, spring range 7-11 psi.
V_3—Three-way water valve, normally closed to pipe grid, spring range 7-11 psi.
V_4—Normally closed steam valve spring range 9-13 psi.
P_1—Pneumatic electric switch to control compressor for air system.
P_2—Pneumatic electric switch to control compressor for ceiling system.



The design of a fermentation room air conditioning system resolves itself to one of seeking a solution to the problem of reduced air motion. The challenge is a severe one for the following reasons.

Air Changes

At the design conditions of 80 deg D.B. and 75% R.H., the dew point is 71.5 deg. At this dew point, the moisture from the sponges is in equilibrium and is not added to the room load. Therefore, the air conditioning system is required to absorb only the sensible heat load due to lights, dump motors and room transmission from the outside during the summer. As seen from Fig. 1, the supply air is at the room dew point of 71.5 deg and a dry bulb of 74 deg. This leaves only 6 deg to absorb this sensible load which makes it necessary to supply approximately 18 air changes per hour to meet the room design conditions.

With this extremely high rate of air volume supply, even the most efficient design of air distribution with ceiling diffusers or perforated plaques left much to be desired. Split systems, similar to those used in the textile industry, were used in the past. With this system the air is supplied at a depressed dew point and water is atomized under air pressure to pick up a portion of the load by the evaporative effect. This succeeded in reducing the volume of supply air. However, the resultant turbulence from the atomizers created crusting and also the maintenance of the spray nozzles was very costly and troublesome. Canvas covers over the troughs, to protect the sponge surface, are also a high labor cost item and eventually cause foreign material problems.

Radiant Cooling

A successful solution to the problem has been radiant cooling. With this approach, by employing a radiant cooled ceiling,* a load pick-up of some 14 Btu per hour per square foot of ceiling area has been made possible. This leaves only 4 Btu per hr per sq ft to be absorbed by the supply air. In other words 74% of the room load is picked up directly by the ceiling with only 26% to be taken care of by the air system. Instead of 18 changes per hour, the supply air has been reduced to 4 changes per hour, which when introduced through ceiling diffusers, brings the air motion in the room well below the point where it will disturb the surface condition of the sponge.

The ceiling is constructed of a pipe grid on one-foot centers. White baked enamel pans are clipped to the one-inch galvanized steel pipes forming an attractive, sanitary ceiling. The walls of the room are constructed of aluminum clad plywood, which acts as a reflector to the ceiling. Water is circulated through the pipe grids at a supply temperature of 72 deg and returns to the chiller at 77 deg. See Fig. 2. The mean water temperature is 74.5 deg, resulting in an effective ceiling panel temperature of 77 deg. The calculated mean temperature of the radiating surfaces in the room is 88 deg.

As noted in Fig. 2, the ceiling system and the air

*System patented by Burgess-Manning Company.

Fig. 3. Counterflow cooling tunnel.

system are served by two separate chillers. The ceiling water temperature is controlled by a three-way valve. Electronic thermostat and humidistat with pneumatic convertors are employed for precise control and consistent calibration.

This system has been in operation for two cooling seasons without any problem of ceiling condensation.

Post-Baking Conditioning

After the baking process has given the cookie or cracker the necessary color, texture and other characteristics, there may be some residual moisture. in some varieties, which is over a specified amount to give the piece the required crispness. This may be on the order of from 2 to 5% and to attempt to remove this by longer baking would mean further browning.

These varieties are conveyed through post-conditioning tunnels where heated air is blown over the product to further lower the moisture content. In cookies with a high amount of sugar, a film of caramel is formed in the baking process. It is extremely difficult to drive the moisture out of the cookie through this film with heated air since the air temperatures must be on the order of 300 deg. This means employing gas-fired equipment to heat the air. The control of such equipment is not simple and its maintenance is high. A method was developed, employing radiant heat, which penetrates deep into the cookie to drive the moisture out without changing the color of the piece.

The radiant tunnel consists of quartz lamps mounted in gold plated reflectors installed over the conveyor belt. The spacing of the lamps is such that the density of radiation will cause no further browning or baking. The tubes are rated at 100 watts per inch and the quartz envelope resists shattering to the extent that an ice cube may be applied while the tube is operating. The life of these lamps is in excess of 4000 hours. Control is very simple since the lamps can be switched off singly or in banks or may be operated at half voltage in the same manner. Maintenance of both the lamps and the gold plated reflectors is low and more than offsets the higher energy cost of electricity over gas.

The time of exposure usually runs about 30 seconds or less, while that for gas-heated air runs around three minutes. With radiant heat much shorter tunnels are required.

Icing and Enrobing Tunnels

In the icing department of a bakery, various forms of sugar-base icings, chocolate and marshmallow are applied to cookie base cake. The sugar icings are generally flowed on as coatings, partial coatings or are whipped and are sandwiched between two cookies as a cream filling. The chocolate is most commonly enrobed over a cookie which has previously had a marshmallow deposit or it may be flowed over a graham cracker or other cookie. The marshmallow is generally deposited on top or between cookies as a sandwich. Some operations may involve all three materials in various combinations; other ingredients such as jellies and grated cocoanut may also be used.

In almost every case the icing, chocolate or marshmallow is applied in liquid form and the piece must be cooled at a specific rate so that the icing will set with the proper degree of hardness to meet a definite appearance requirement and be firm enough to stand handling in the packaging machines without marring the finish of the product.

The rate of cooling is highly important since icings and chocolate set or become solid by a process of crystallization. The setting of chocolate is the most critical of all the icing materials since if the cooling is too rapid, large, unstable crystals of cocoa butter will form. These crystals will remelt later, in the package, and reform as smaller more stable crystals. When this happens, the surface appearance of the product takes on a dull, whitish look known as "bloom" and the product is then unsalable. This is commonly encountered in chocolate bars which have been exposed to summer heat.

To cool or set iced varieties, the pieces are conveyed through cooling tunnels where refrigerated air, under temperature control, is blown on the product. The rate of production, and the rate and degree of cooling determine the cooling time; this in turn establishes the length of the cooling tunnel.

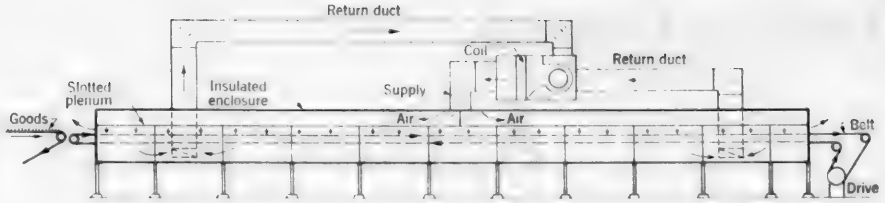
The cooling load is largely sensible heat and this load is made up of: The heat of fusion or crystallation of fats and sugars; the specific heat removal from the initial temperature to some final temperature; the sensible and latent heat due infiltration of ambient air through the entrance and exit openings for the belt and product; and finally, the radiation and convection losses from the tunnel and ductwork. If any water is used in the icing, this will be evaporated to add a latent heat load to the conditioning apparatus.

The method of introducing air in the tunnel is either of two methods. The first method is by counterflow. With this system, the supply air is fed into the tunnel at the exit or leaving end, and the coldest air contacts the coldest goods and then travels up the length of the chamber, in opposition to the flow of product, to pick up the heat load. At the entering end of the tunnel, a booster fan recirculates back through the cooling coil and the supply fan. This is illustrated in Fig. 3. The second method is to feed the air into a plenum forming the top of the tunnel. Air then flows through slotted openings or nozzles in the bottom of the plenum to impinge directly down on the product. A space on both sides of the conveyor belt permits this air, which has picked up the load, to flow down to a return plenum under the belt from which it is recirculated back to the conditioning apparatus. This is illustrated in Fig. 4. In some instances, a combination of the two methods are used.

Comparison of Cooling Methods

The counterflow method has the advantage of the

Fig. 4. Down blast cooling tunnel.



greatest temperature rise, since it has the longest period of contact between product and air. Also, counterflow heat transfer is the most efficient, thermodynamically. This means the system requires the smallest air handling equipment and therefore results in the least cost. There are two serious drawbacks, however, to this method.

First, the air is introduced at the exit end of the tunnel where it will have its greatest positive static pressure and, therefore, will tend to flow out of the belt opening into the room. The return is taken at the entering end of the tunnel where it will have a high negative static pressure and will tend to draw room air into the system from the adjacent belt opening. This infiltration may easily amount to two or three tons of refrigeration.

The second drawback is that the air is traveling parallel to the belt and although the mean air velocity may be 1500 fpm, the drag velocity at the goods may be only 200 fpm. This is not high enough for a good surface air film heat transfer conductance factor. To increase the velocity to an optimum for good heat transfer would mean a velocity so high that the goods will move out of pattern on the belt. Furthermore, if the cookies are shingled or lapped, the air will only contact the edges of the goods.

The downblast method has the advantage of providing high air velocities to "scrub" the product, thus ensuring good heat transfer. If the goods are shingled, this method permits the cool air to be driven around more of the surfaces of the cookies for more complete contact. Furthermore, it is possible to split up the supply air so that it may be zoned for different temperature levels. The air is introduced at the same static pressure all along the tunnel and it is therefore easier to control infiltration. The main drawback is that the air is in contact with the product for only a short time and, therefore, the temperature rise is small, usually only 5 or 6 deg compared to 15 or 20 deg in a counterflow tunnel. This means large air handling equipment, greater space loss and cost.

The counterflow tunnel is generally employed for chocolate cooling. Air for the tunnel is supplied at 55 deg and the temperature gradually rises to 70 deg when it contacts the entering goods after the cookies traveled some 100 to 120 ft. Under proper control, this is about right for proper crystallization of chocolate. The downblast method is usually used for cooling sandwiched varieties where the cooling rate is more severe and the air supply temperatures are close to 40 deg.

The problem of infiltration into the tunnel is a tough one since the entrance and exit of the tunnel must have openings to permit the belt and the goods to pass in and out of the chamber. This is met by either installing baffles to restrict the air or by providing excess ambient air to the conditioning apparatus so that the tunnel will be under a slight positive pressure and there will be a deliberate loss of air from both openings to offset infiltration.

The tunnel enclosure is constructed of insulated panels on an angle iron frame. The panels are generally constructed of a rigid board of expanded styrene plastic or polyurethane and is sheathed with an aluminum skin or aluminum clad plywood. Care must be taken with the fasteners and structural members so that there is no through protrusion which would expose cold metal to the ambient air to cause sweating.

The construction should be designed from a sanitation viewpoint so that the unit is easily cleaned. It should have properly latched and gasketed access doors to permit workers ready access to the inside of the tunnel. Any windows should be made of a plastic such as plexiglass to preclude breakage and product contamination. In addition, the windows should be made of double thickness with an air space to prevent sweating. The return belt of the conveyor should be included in the cold air stream so that the cookies will be deposited on a cold surface. This is very important in the case of chocolate enrobed goods to ensure good smooth bottoms on the product. All surfaces of the tunnel should be smooth with no pockets to catch crumbs.

Packaging Department Refrigeration

Many varieties are packaged in wax paper in the form of a sealed envelope. The automatic packaging machine generally crimps the wax paper seam with an electrically heated head and then follows it with a refrigerated head which sets the wax to form the final seal. Usually chilled ethylene glycol brine is circulated at about 0 deg to the chilling heads. In the case where these heads are stationary, a direct expansion refrigeration system may be used.

In cases where non-iced cookies are packed in wax paper, cooling tunnels may be used to bring the product down under 90 deg so that they will not affect the wax paper. Cellophane wrapped varieties must be under 100 deg to be properly packaged. The cooling tunnels employed are similar to those described for icing.

Refrigeration Loads and Future Trends

To handle the process refrigeration and air conditioning loads, from raw material storage through the packaging and icing operations, a modern bakery may contain 300 to 1000 tons of installed refrigeration capacity, depending on the size of the bakery. This is in addition to comfort air conditioning for the various offices and employee facilities. Some southern bakeries may air condition the entire icing and packaging departments.

Future developments in the baking industry lie mainly in more automatic packaging at higher speeds. To meet the stringent requirements of uniformity that these machines have, further developments must be made in the application of air conditioning in cooling the product to meet these specifications.

Common Errors in

Application of Three-Way

S. DARYANANI

Design Engineer, Syska & Hennessy, Inc., New York, N. Y.

Herein are several suggestions to be considered when choosing water valves in air conditioning systems that may help avoid situations where valves hunt and quickly wear out, and where they do not control flow at all.

ANY piece of equipment, if undersized or incorrectly applied, can be a source of constant complaints. At times, an oversized piece of equipment will cause an equal amount of trouble. An automatic three-way valve, which is often used incorrectly, is a good example.

Figure 1 illustrates a common application. A three-way valve is used to blend refrigerated 42-deg F water with return water to obtain a constant 54-deg supply for the secondary water system that supplies a building's perimeter cooling units. It is sized for the total amount of water circulated. It will be shown that, even under full-load conditions, the valve is oversized, because it does not open more than 45.5% to the low-temperature side.

If x be the percentage opening to the 42-deg side, $(100 - x)$ will be the percentage on the return water side. Under normal operating conditions, the maximum return temperature of the secondary water system does not exceed 64 deg. Therefore:

$$42\,x + 64\,(100 - x) = 54\,(100)$$
$$22\,x = 1000$$
$$x = 45.5\%$$

Since a major part of the load on a perimeter system is due to solar effect, which lasts for only a few hours, it can be shown that for the balance of the day, the valve opening is closer to 20%.

It is an uneconomical application if half of the valve capacity is never used. In addition, the system will have the following defects:

(a) In case the controlling thermostat has a narrow differential, the valve will hunt and its operating mechanism will quickly wear out.

(b) With a controlling thermostat having a wide differential, the system loses control of secondary water, the temperature of which is likely to drop below 54-deg, especially during start-up.

If, due to low secondary water temperature, condensation takes place on coils, the consequences could be serious, because in most commercial installations condensate drains are omitted.

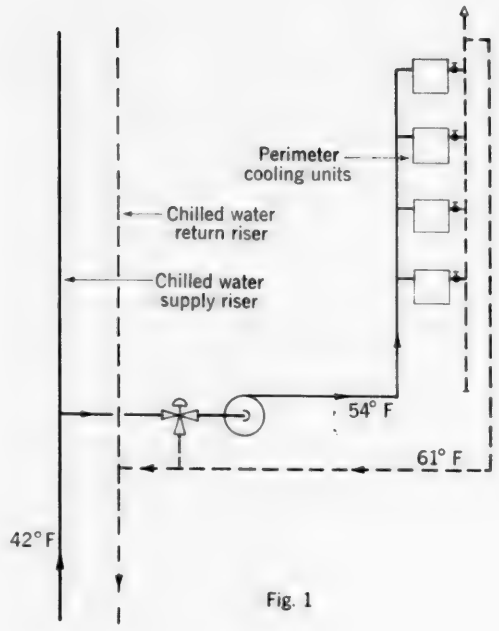


Fig. 1

Over-cooling of secondary water can be avoided by limiting the travel of the three-way valve to a required maximum, but such fine adjustments, being time consuming, are seldom made in the field.

(c) The trouble due to condensation could be compounded in case the valve, due to some defect, remains

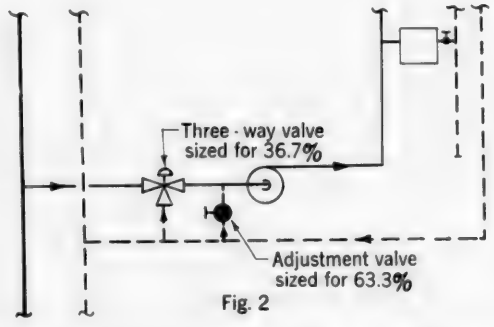


Fig. 2

Valves

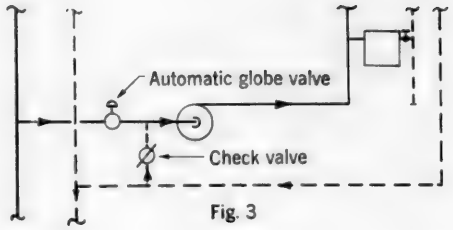


Fig. 3

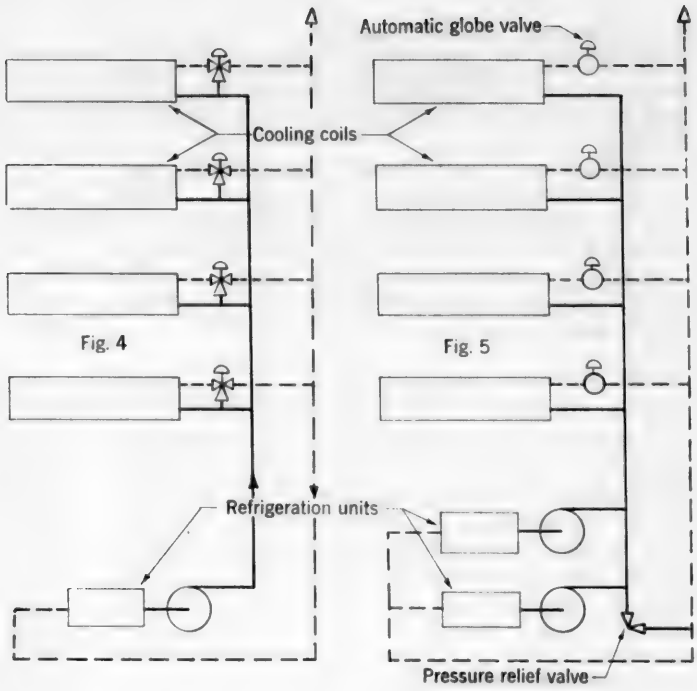


Fig. 4

Fig. 5

completely open to the 42-deg supply, circulating low-temperature water through the system.

Resizing Will Improve Performance

The arrangement in Fig. 2 corrects these defects and, in addition, results in a saving, as a smaller three-way valve will now suffice. The valve has been now resized to accommodate the maximum flow of 42-deg chilled water and not for the total amount circulated. An adjustment valve will handle the difference between total quantity circulated and the quantity of water flowing through the three-way valve.

Globe Valve Substituted

A further improvement is the arrangement shown in Fig. 3, which dispenses with the adjustment valve and substitutes an automatic globe valve for the three-way valve. The set-up is not only economical, but provides satisfactory control. The globe valve is sized for the maximum flow of 42-deg water at a pressure drop equal to the pressure difference between supply and return mains. The size of the globe valve will be smaller than the three-way valve in Fig. 1, which is sized for the total amount of water circulated at minimum pressure loss. Some saving is also achieved in the operating head of the secondary water pump, as it no longer has to pump through the half-closed control valve.

Multiple-Compressor Systems

Figure 4 illustrates another common application of three-way valves: an application that is satisfactory when the system has only one refrigeration unit and one chilled water circulation pump. The difficulties arise in case of a multiple-unit system, having more than one refrigeration unit and more than one chilled water pump with a number of cooling coils, each controlled by a three-way valve. In such a multiple-unit system, it is not possible to stop any refrigeration unit or pump without affecting the performance of the cooling coils and therefore the advantage of having a multiple system is negated. This is why:

Poor Humidity Control

When a cooling coil is controlled by a three-way valve, the quantity of chilled water passing through the coil decreases as the load on it is reduced. The difference between full-load and part-load circulation is by-passed around the coil while constant full-load circulation is maintained in the mains. Suppose that only partial cooling is needed on all the coils and due to this one pump of the multiple system, together with its corresponding refrigeration unit, is shut down, thereby reducing the quantity of chilled water circulating through the system. The three-way valves on the cooling coils nearest to the circulating pumps will continue to by-pass a large percentage of the quantity they were by-passing on full load (because the quantity of water by-passed depends on the amount of the part load) and the cooling coils farthest from the pumps will be starved.

On the other hand, constant flow of water may be maintained during part load with only the necessary number of refrigeration units in operation. In this case, part of the water passing through inoperative units will mix with that from the operating units and the final temperature of water in the supply mains will be higher than the design temperature. This water, when flowing through cooling coils, could provide satisfactory cooling, but not without raising the humidity of the air conditioned areas.

The dehumidification effect of a cooling coil is proportional to difference between coil entering-air dew-point temperature and chilled water supply temperature. Consequently, any rise in temperature of supply water will reduce the dehumidification capacity of the cooling coils. In contrast, dehumidification load of an air conditioned space generally remains constant due to constant internal load. It might even increase, as in the case of applications taking in a high percentage of outside air,

since a drop in outside air temperature is usually accompanied by a rise in its moisture content. Under these conditions, with a rise in temperature of the chilled water, room temperature may be satisfactory, but humidity will be higher.

A multiple-unit system controlled by three-way valves requires constant circulation of chilled water at a minimum design temperature which, on part load, can be obtained only by operating all the units of the system on part capacity. Such operation will be equivalent to having one main plant because all the units have to work to provide satisfactory cooling and dehumidification.

Efficiency at Partial Load

In order to derive full advantage of flexibility on part-load operation, cooling coils of a multiple-unit system should be controlled by automatic globe valves, as in Fig. 5. On partial load, flow of water through the cooling coil will be reduced by the throttling action of the valve, while the entering temperature of the chilled water will remain constant. Substantial throttling on all cooling coils will cause a pressure rise in the supply mains which can be relieved by providing a pressure-operated by-pass valve near the pumps. Thus, when cooling load is reduced, the flow of chilled water in the mains will be reduced accordingly. If flow of the chilled water in the mains is reduced sufficiently on part load, a suitable number of refrigeration units with their circulating pumps can be stopped. In other words, the number of units in service can be proportional to the cooling load of the system.

Valves for Diverting Service

Three-way valves should be used with caution on applications requiring diverting of water rather than mixing. One such application is illustrated in Fig. 6, where a three-way valve is used to maintain constant condenser water temperature for an absorption refrigeration unit.

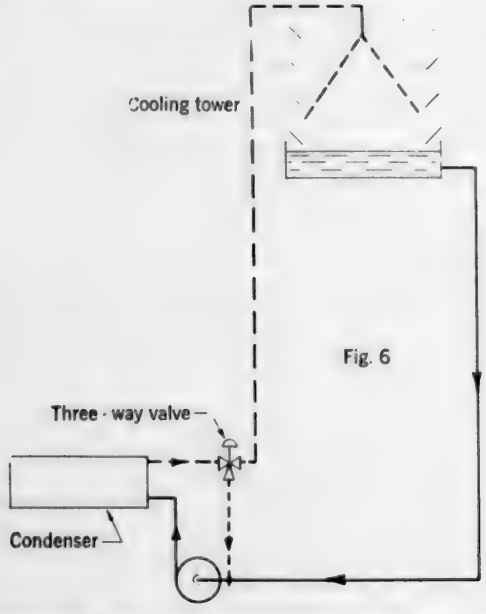


Fig. 6

A three-way valve will serve for diverting service only when an equal pressure exists on all the three sides. Looking at Fig. 7, showing internal construction of a

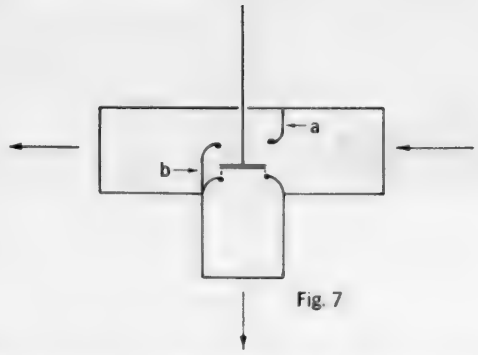


Fig. 7

three-way valve, the valve disc will have an upward force in position *a* if pressure on the entering side is higher than that on the two leaving sides.

The force will be downward when the disc reaches position *b*. Due to this reversal of forces, it will not be possible to keep the disc at an intermediate position and to get modulating control, as it will tend to jump between positions *a* and *b*. The control action will not be smooth and further, it could produce undesirable water hammer in the pipe lines.

The three-way valve should be replaced by two globe valves as shown in Fig. 8. Even the valve *B* can be eliminated if branch *ab* has a high pressure drop compared to branch *bc*.

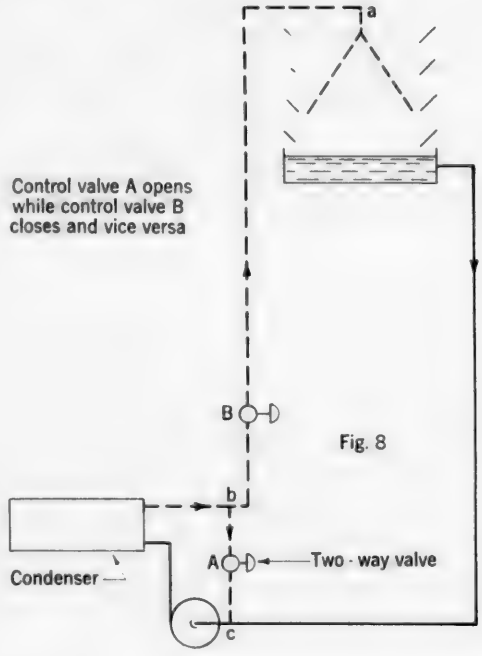


Fig. 8

Conclusions

The designer should take into account the following points when considering use of a three-way valve:

1. The valve should be sized for only the amount of water to be controlled. Oversizing of the valve should be avoided.

2. The effect of a constant-flow arrangement on the remaining parts of the system should be analyzed.

3. When used for diverting service, the three-way valve should have equal pressure on all sides.

Packaged Report on ARI

Components of this packaged report include abstracts from two of the papers presented at the conference session of the 11th Exposition of the Air-Conditioning and Refrigeration Industry, sponsored by the Air-Conditioning and Refrigeration Institute and held on November 2-5 at Atlantic City, N. J.; also, an interview with the ARI managing director, George S. Jones, Jr.; and finally, some reactions to the Exposition from visiting engineers and contractors.

Air Conditioning of Shopping Centers

A plea for the integration of central air conditioning in the initial design of shopping centers, rather than leaving air conditioning up to each individual tenant, was the theme of the paper presented by Herman Guttman, partner, Victor Gruen Associates, Los Angeles, Calif. Mr. Guttman, a registered architect in the State of California, received his Bachelor of Architecture degree at the University of Minnesota Institute of Technology in 1941, and did graduate work at the Harvard School of Design.

Only a few years ago it was commonplace to find signs on doors and windows of commercial establishments proudly announcing that they were "Air Conditioned". The store owner, more interested in the announcement than in performance, was rarely preoccupied with drafts and noise factors. As long as cold air came out of the gadget, he was pleased and proud that at his own expense he had installed the equipment, provided necessary ductwork and structural changes, increased electrical service, and paid for all operation and maintenance.

This pattern in the commercial retail field has prevailed. Even in regional shopping centers, conceived as integrated, planned entities, the developer tells the tenant to put in his own air conditioning.

The reasons for his attitude are many: (1) No space required for central plant equipment. The tenant puts his equipment in space he rented or on the roof. (2) No financing required to cover equipment cost. (3) No operating personnel required; no operating cost to recover from tenants through metering or other methods which often are extremely complicated because of a variety of store hours and other departures from a standard pattern.

(4) Leasing is not complicated by discussions of standby charges, wet-bulb, diversity factors, and all the mumbo-jumbo that neither leasing agent nor tenant comprehend. (5) Complaints about air conditioning fall on deaf ears.

Although our developer is happy, his architect-engineer is *not*. "The Shopper's Dream" begins to sprout equipment on the roof closely resembling the exhibition here at the convention. Adequate screening is costly and the roof must be designed to carry the equipment loads, adding cost to the structure.

The most disturbing aspect is the gross inefficiency. The central plant is far more economical both in first and operating costs. Fractional tonnage increments, diversity factors, lower electrical rates through single metering, standardization of filters, spare parts and organized maintenance programs all contribute to the overall savings in a centralized system.

Our job is to provide an efficient air conditioning facility within the prevailing leasing pattern, and attempt to eliminate those problems of the developer outlined. To some degree this has been accomplished in the design of the Southdale Shopping Center, Minneapolis, an 800,000-sq ft multi-level center containing two department stores and some seventy other shops under one roof. Because Minnesota climate leaves something to be desired, shopping-wise, it was decided to create an artificial environment that would, in effect, be a "perpetual spring". Two levels of stores are grouped around a block-long Garden Court, 50 ft high, and all storage and deliveries are located in the basement. This highly compact building arrangement has a minimum of external exposure which requires cooling.

Internal heat generated by lights and people is transferred to the perimeter of the building to offset heat loss through exterior walls and the roof. *Southdale has the lowest operating* cost for heating and cooling of any comparable shopping center.

Availability of 50-deg well water, facilities for disposition of water; availability of natural gas at competitive rate; and other engineering considerations influenced the decision to install the largest commerical heat pump in the United States in combination with packaged air conditioners in tenant sales areas. Water flow cycles are completely interlocked, and by an arrangement of heat exchangers and flow control, exceptionally high efficiency was obtained.

It was no easy task to convince the developer, tenants, leasing men, building superintendents, and municipal authorities. First studies indicated it was cheaper to cover the mall and arcades and air condition the added space than to omit the roof. We attacked the developer's arguments point by point:

(1) Penthouse space at relatively low cost was available for fans and compressors, reducing piping and wiring and eliminating all major ductwork with corresponding reduction in the cubage of building. (2) Financing was accomplished by a system of standby charges to tenants, over and above rents, in order to amortize the central plant equipment. The lending institutions, once they, too, were convinced, were willing to capitalize these charges

just as they did rent in determining the amount of the loan.

(3) Careful selection of superior equipment and an elaborate automatic control system has resulted in a minimum of operating personnel and operating cost. To eliminate complicated metering, a formula palatable to tenants was devised establishing tentative monthly charges for the operating to be adjusted at the end of the year based on actual performance. (4) Leasing was difficult but not insurmountable. Unfortunately, the leasing representatives of major tenants are quite separate from their technical associates, and it was necessary to get together with their engineers. With the success of Southdale, however, we feel that the next one will be much easier.

Where and How DoD Uses Air Conditioning

A need for cooperation between architect-engineers and the people who produce the essential equipment for air conditioning and refrigeration applications in the nation's defense establishment was stressed in the paper delivered by Thomas R. Casberg, staff specialist, mechanical equipment and systems, Office of the Assistant Secretary of Defense, Properties and Installations. Mr. Casberg is responsible for design, construction, maintenance, and operation related to mechanical equipment in the far-flung DoD.

Multiple Systems vs. Central Systems

Associated with the objective of low-cost, long-term maintenance and operation is another widely discussed segment of (Defense Department) policy—use of central systems and prohibition of multiple units. All our studies and data obtained from industry indicates that only a central system is capable of quality air conditioning coupled with long-term, low cost maintenance and operation.

Walter Reed Hospital in Washington was an example of the wastefulness of multiple units. At one time there were 832 separate condensing units in this building complex. About thirty-seven different manufacturers were represented. When I talked with the maintenance foreman about spare parts, a wild look came into his eyes. The commanding officer expected him to make emergency repairs on practically all of the units and the supply system would not keep an item in stock if there was no activity for six months. A central system is now being installed.

It has been stated that the Defense Department policy prohibits room coolers and packaged units. This is not true. We have many installations of each. Many houses have only one bedroom cooled and this is logically accomplished by a room cooler. There are many small offices in non-conditioned facilities such as warehouses and automotive shops where room coolers are used. The Department has countless small buildings where a single package unit, either DX or chilled water, is the central system for the building.

Epidemics in Air Conditioned Hospitals

Hospital air-conditioning and the prevention of the spread of infectious organisms by such systems is a very important current problem. A solution is needed not only for new hospitals but indications are that modifications are needed in existing hospitals. *Time* magazine pointed out that hospitals are now the major source of fatal infections. The people of Houston will not forget last year's tragedy when a number of infants died in one sweep of a hospital-originated infection. The medical profession has used the term "fearful epidemics" to describe the results of lack of control of antibiotic-resistant organisms such as staphylococci in hospitals. Medical authorities, both military and civilian, are blaming air-conditioning systems for part of the problem.

The problem is partly cleanliness. It seems to be necessary to be able to get in, around, and behind any air conditioning equipment in patient rooms in order to scrub, wash with chemicals, or perhaps steam the equipment. So far, the only suggestion is merely an evasion: 100% fresh air for the entire hospital through a double-duct system. The industry is much more ingenious and can recommend a better solution which is reasonable in cost.

The present ARI certification program is good and very helpful to all Government agencies. In the near future the Air Force will probably include ARI certification in their specifications for family housing. At the Air Force air-conditioning conference in July, Maj. Gen. Minton, Air Force director of civil engineering, expressed the hope that the certification program would be substantially expanded to include heat pumps, larger units, components, and related equipment.

Engineering Poor in Housing Developments

The industry can provide much needed assistance in the big problem of design criteria. The air conditioning of family housing is a good example. The practice in the Capehart housing program is to engage local architect-engineers for each base. It has been noted that not too many A-E firms have had experience with house air-conditioning. Many times there is plenty of architecture but not much engineering. As a result there are troubles.

Many fine pieces of equipment are damned because of poor application. Noisy and improperly placed grills and ducts, poor thermostat locations, undersized or blocked cooling towers, poor access for maintenance and many other design failures of omission and commission can reduce the value of good refrigeration equipment.

The matter of access for maintenance is imporatnt to all. Unfortunately, there is housing at a southern base where the first requirement for the maintenance man is that he be no larger than a jockey. To get to the unit he must parade through the house, through the master bedroom, empty the storage closet of a few chests, bags of golf clubs and portable sewing machines, get down

on his knees and crawl through a hole. To replace a cycle it is necessary to take down a living room wall, but fortunately the architect realized this and the wall is a special movable one attached with screws! It is probable that this unit will not be properly maintained and one may suspect any undue or early failures will eventually be to the discredit of the manufacturer.

You can help yourself by helping us. We need strong

representation to architects and engineers in the correct manner to apply your equipment—not just individual pieces of equipment but the combination of all items which make up a system. This is not a plea to do the design work but it is a plea to work closely with A-E's and insist on the elimination of known application errors.

ARI Strives for Honest Ratings

In order to determine the operation, aims, and future plans of the Air-Conditioning and Refrigeration Institute, the editors of Air Conditioning, Heating and Ventilating interviewed George S. Jones, Jr., managing director of ARI.

Q. Mr. Jones, what was the major problem in the industry that prompted formation of ARI? And what has ARI done about it?

A. After World War II there was a tremendous increase in air conditioning, not only, as before the war, in the large installations, such as theaters, department stores, and hotels, but in small commercial establishments and in homes.

Along about 1946 or '47 the number of room air conditioners sold each year was around 25 or 30 thousand. By 1953, sales rose to slightly under a million. This growth has continued, interrupted a little bit some years with a stop and stagger, so to speak, but now amounting to perhaps a million and a half a year.

Sales of central residential units went slowly at first. In 1952 there were probably no more than 10 or 12 thousand such units sold. This year we expect to sell around 200,000 units and another 150,000 commercial units to small stores, restaurants, and what have you—to those who can be air conditioned with packaged equipment.

Q. These are the units within the province of the Unitary Air-Conditioner Section, are they not?

A. That is correct. Now, in any industry that grows that rapidly, you're going to have some problems, a major one having to do with the methods of establishing the capacity or direct performance of the refrigeration cycle.

One of the major contributions of ARI has been the establishment of equipment standards. These standards, in most cases, are based on testing procedures developed by the professional societies, particularly the American Society of Heating Refrigerating and Air Conditioning Engineers.

Q. How do you achieve compliance by the manufacturers with the standards you've adopted?

A. The certification program of the Unitary Air-Conditioner Section is designed to take care of that. The fact that a trade association cannot require that its members comply with its standards made it necessary to follow other procedures. We can and do invite members and non-members to participate in the program which follows, roughly, this procedure:

A contract is drawn up between ARI and the manufacturer, who agrees to test his units in accordance with the standards, in facilities that are adequate, and to submit the results to the compliance committee, of which

"... vast majority of manufacturers want to be honest . ."

our chief engineer, Mr. Fred Reed, is chairman. On inspection and acceptance of those test data, the right is given to place a seal on the unit and use the fact of participation in advertising.

Q. Does the manufacturer test with his own facility?

A. That is right.

Q. But you do have a way of checking up on this?

A. Yes. A part of the program includes a contract with an electrical testing laboratory. We pick up at random a model produced by a participant, take it into the lab, and test it. If the results show the unit is overrated or that other claims have been made that are not substantiated by the test, the maker must either withdraw from the program, re-rate his units on the basis of test data, or redesign his unit to come up to his claims for it. Of course, we have a procedure that takes into account the fact that in this era of mass production an occasional defective unit, or ones damaged in shipment perhaps, might have been picked. But basically, the manufacturer agrees that variations from published claims will remain within a small-percentage tolerance on any unit they produce.

Q. Have you caught anybody cheating yet?

A. No, we have not. I must add, of course, that this program has just been started this year. However, a vast majority of the manufacturers want to be honest and will be honest and there are not going to be very

many false claims found. But on the assumption that there will be some, of course we are going to continue to check.

Q. Is it not true that the manufacturers help to police each other, too?

A. In our industry, as in most others, progressive manufacturers test competitive makes to find out how they can improve their own. If they feel that a competitor has been overclaiming or misrepresenting, and are satisfied that their tests have established that fact, they can then request that ARI pick up a specific model and, if necessary, interrupt the random testing program and get it on test quickly. If it turns out that the complaint is not proven valid, the complainant pays the cost of the test. That provision is put in there to avoid anybody just taking a shot at a competitor on the chance that he might be phoney.

Q. You have made the Directory of Certified Unitary Air-Conditioners available to all engineers. How are they supposed to use it?

A. That Directory is published purely as a matter of information and convenience. We point out very clearly that ARI has *not* tested the units at the time of publication, that the ratings therein are merely the statements of the manufacturers that their units have been tested and rated in accordance with the standard. There is no claim that those whose name does not appear there don't have just as good a unit. All it says is that they have not said so to *us*.

Q. Recently you announced that the heat pump will soon be coming under a similar certification program, and we noticed in that connection that Standard 210-58, under which they, and the present air conditioning units are tested, is undergoing revision.

A. Well, it is constantly under revision. There is no particular phase of it that is going to be revised, as such. You may have in mind that the testing procedure developed by ASRE is being revised by ASHRAE. If and when it is, and if we find ourselves in agreement with it, as we no doubt will, then the new testing procedures will be referred to in our standards.

Q. Mr. Jones, is the influence of ARI felt at all in the big units? We know that units above about ten tons are not covered by the certification program.

A. That is a matter of expediency, because of the obvious difficulty of shipping a couple of hundred tons around the country. ARI standards do apply, however, to the larger units, though we have not established a certification program on them yet.

Q. But a manufacturer of a larger unit can and does state that his unit is tested and rated under the standard.

A. Yes sir, whether he be a member or not. We are quite aware of the increasing need expressed for equipment standards, some of which we have and some of which are yet to be developed, along with some form of certification program. How fast and how far that moves, I can't say.

We don't have much trouble where one manufacturer buys from another because product engineers are dealing with product engineers, and they can get down to cases pretty fast. Actually, the greatest need for complete establishment of the integrity of rating and performance claims is in the area of consumer, design engineer, architect, and builder, where time and facility to make an individual inspection are lacking.

Q. Does ARI perform the function of an information center?

A. We will and do answer all general questions to the best of our ability. We cannot answer a question that has to do with the relative quality of performance, size, or anything else about products. In other words, we cannot answer a question like "Which manufacturer should I buy from?"

Q. Suppose someone asks which manufacturers produce, say, heat-operated air conditioners?

A. We can give them a list of our members, but we also point out that this is not necessarily a complete list and suggest that the questioner get in touch with the trade journals who usually have a much more complete listing of producers.

Q. Do you get into problems of product application?

A. No, if you are talking about duct sizing, chilled water piping, etc., not much. There are other groups, such as National Warm Air, I-B-R, and the Societies that deal with that. Our members, of course, are very interested in the proper applications of their products.

Q. Are we correct in the impression that ARI shows will be able to go places where the ASHRAE shows will not because of their tremendous size?

A. Well, there is something to that, although it is hardly descriptive of policy. The ARI show developed out of the refrigeration industry, the ASHRAE show out of the heating and ventilating industry. For many years we have alternated the years of our show with theirs, and separated them as to time and location to some extent. We have now decided to hold our shows, on alternate years, in late January or February, as ASHRAE does, the next show being in 1962.

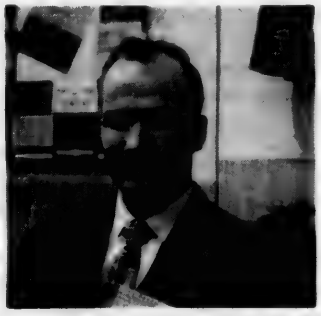
Q. Have you decided where the next show is going to be?

A. Not finally. Up to a few years ago, the bulk of producing facilities and the market was in the North and East, roughly in an area bounded by Chicago, New York, and Cleveland. In recent years our members have been establishing branches and plants in the South and West, and the markets in these areas have grown rapidly. The people who handle the business in these areas have grown in numbers: engineers, contractors, dealers, and distributors. There is a growing feeling that we should hold shows in those parts of the country, too, in fairness to the people there.

It is true that the ARI show is smaller than that of ASHRAE, and that to a greater degree than us they are limited by their size as to location. We do have little more leeway. Furthermore, there are many new facilities being built, as in Dallas, Miami Beach, Atlanta, and Los Angeles. Therefore, we are seriously giving consideration to holding our shows in areas where they have not been held.

Reactions to the Show

Five visitors to the ARI show were stopped at the ACH&V booth and asked to give their comments to these questions: What did you (as an engineer or contractor) see that was unusual or of significance at the ARI show? Did you discover any new product, application or technique which you will be able to use in future work?



Thomas A. Shallow, P.E., a facilities engineering standards supervisor for International Electric Corp., Paramus, N. J.

I was particularly interested in the number of heating and cooling units for roof mounting on industrial buildings that were shown. That sort of thing for factory or commercial installation is very economical of floor space, which is what we're fighting for and paying for, and I think they do show an advance in that area.

I was very interested in the presentation at the conference session by Thomas R. Casberg, of the Office of the Assistant Secretary of Defense for Properties and Installations, in his discussion of the requirements—some of them special to the Defense Department—for their various installations. He got into the area of the particular standards they use, and he indicated the value to the Defense Department of being able to use the ARI standards in judging equipment and being able to select in some cases equipment on the basis of quality rather than just low bid, which can be quite useful.

Harry Terry, consulting engineer, Trenton, N. J.

One of the things that impressed me most was the excellent exhibit that most manufacturers put out. In some cases, however, advertisers who are very well known failed to show their equipment and tried to fill the requirement with illustrations of the product rather than the product itself. One of the most interesting exhibits, and this was not of one manufacturer only, was the new packaged conditioners using air cooled condensers. These have a great application and will undoubtedly be developed much farther and in larger sizes.

Whenever I go to an exhibit or convention of this type, I am always looking for some ideas or stimulation of imagination in the application of products, and it would appear to me that this exhibit here would stimulate most anybody's imagination. I've seen many applications which I hope to be able to work out in connection with jobs that are coming through at the present time.

Andrew Truhan, of Thermal, Incorporated, Iselin, N. J.

I think there are quite a number of things which show an improvement over other lines and I feel a show of this type is very beneficial to the industry. There are too many items which I was interested in to comment specifically, and therefore I would say, in a general statement, that it is a very interesting show.

I believe there is one item. It was a three-way water regulating valve controlled off head pressures—I don't remember the manufacturer's name but we do have the literature—and we may adapt it to some of our processes. We're industrial engineering contractors and therefore we're looking for new innovations all the time.

Don Pasiadis, of F. H. Pasiadis & Associates, consulting engineers, Cleveland, Ohio.

I'm afraid the answer to that would be no. Personally, I am disappointed that I didn't find any new products, spectacular new products, at this show. Especially, I didn't find enough of a presentation to be able to compare different equipment in the industry.

My answer to that would be again no. Except for the temperature control industry, the rest has been a repetition of what has been shown two years ago in Chicago.

Charles V. Chudoba, design engineer for International Electric Corp., Paramus, N. J. Specialty: air conditioning for electronic computers.

I observed many new methods which are applied in the air conditioning field, mainly the use of aluminum in casings and duct work. Other items which attracted my attention were the hermetic compressors which more and more are used for air conditioning and refrigeration.

Some of the many interesting items which are on display here are the cooling coils and cold plates which I can use in my work for the design criteria on some of the air conditioning problems connected with computer installations.

Suction Line Piping Hookup to Parallel Compressors

J. R. HARNISH
Engineer, York Division, Borg-Warner Corp., York, Pa.

What must be done to provide good operation when multiple refrigerant compressors are installed in parallel. Improper suction line piping and also the recommended practice of a suction line arrangement are discussed. This is the third article of a series on refrigerant piping hookups.

SUCTION line piping to parallel compressors differs from single compressor installations in that precautions must be taken to assure proper distribution of oil returning from the evaporator so that neither compressor crankcase becomes starved.

Figures 1 through 3 illustrate poor suction line piping to multiple compressors. These installations are likely to result in system operating difficulty. Figure 1 shows individual compressor suction line takeoffs from the common header connected to the bottom of the header. Most of the oil returning from the evaporator through the common suction line will tend to drain through the bottom outlet of the tee to compressor *B* due to the force of gravity. Little oil would then be available to compressor *A*; in time its crankcase would become void of oil, resulting in nuisance shutdowns if the compressor is adequately protected by an oil failure safety switch.

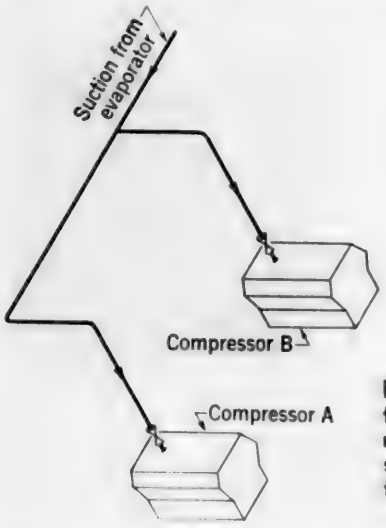


Fig. 1. Improper suction line piping with multiple compressors. Most of oil will flow to compressor B.

If the individual compressor suction line takeoffs were relocated to come out of the side of the common suction header, as illustrated in Fig. 2, most of the oil returning from the evaporator would flow to compressor *A*. Oil flowing with the suction gas in droplet form or clinging to the pipe wall, tends to flow in a straight path due to the gas velocity. Therefore, compressor *B* will not have its crankcase adequately replenished.

A further modification of the piping, Fig. 3, shows vertical takeoffs from the common suction header to the individual compressors. This is not satisfactory as shown since oil will accumulate in the common header, particularly at reduced load conditions, and likely both compressors will suffer from lack of oil.

A number of multiple compressor installations have been made with the compressor crankcases equalized as illustrated in Fig.4. Where the crankcases are internally equalized to suction pressure, operating difficulties may be encountered due to the inability to keep each compressor crankcase satisfied with lubricating oil. The result may be nuisance shutdowns of compressors requiring frequent visits by a service man.

Unequal Operation of Compressors

When equal size compressors are operating at the same increment of capacity, operation is generally satisfactory. However, when one compressor pumps more refrigerant vapor than another, equal distribution and retention of the lubricating oil becomes difficult. Figure 4 represents a condition where one compressor is operating at 100% capacity while the second has half of the cylinders unloaded to provide 50% capacity. Suction gas from the

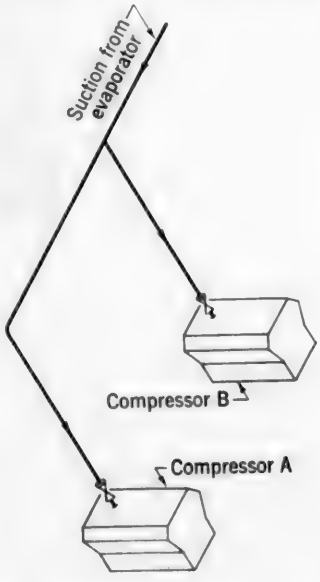


Fig. 2. Improper suction line piping for most of oil will flow to compressor A.

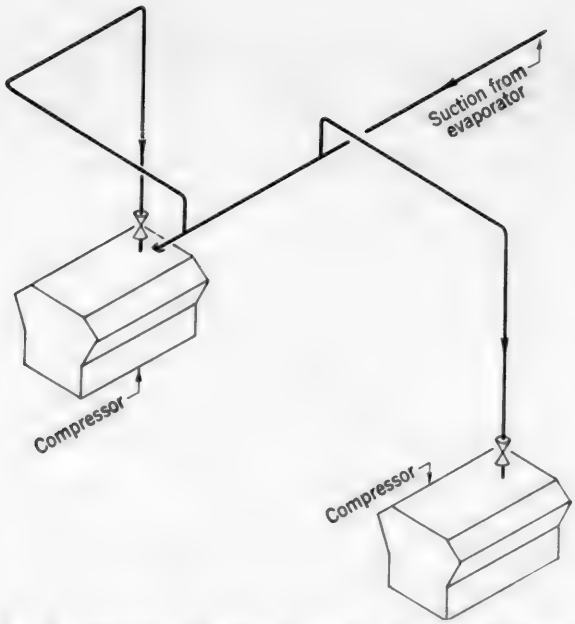


Fig. 3. Improper suction line piping for large quantities of oil can accumulate in the common suction header.

evaporator at a pressure of 37 psig must divide and flow through branch circuits to each compressor. Some pressure drop is encountered in the branch lines, particularly at the service valve on each compressor.

Fluid pressure drop varies approximately as the square of the velocity and with twice the vapor flow rate to compressor 1, the pressure drop through its branch suction line will be about four times that of compressor 2. A slight additional loss is encountered beyond the service valve due to entrance losses at the compressor including the pressure drop through the compressor strainer.

For the conditions noted, the crankcase pressure above the oil level in compressor 1 will be 36.0 psig while that in compressor No. 2 will be 36.75 psig. With gas and liquid equalizers connected between the two crankcases, flow will result. Oil will flow through the liquid equalizing line from compressor 2 to compressor 1, and gas will flow through the upper equalizer in an attempt to offset the pressure difference between crankcases.

Since the gas equalizing line is small in comparison with the individual branch suction lines, its ability to equalize crankcase pressures is limited, and although it will continue to pass gas to the compressor operating at a higher step of capacity, a differential pressure will always exist between crankcases for unequal increments of compressor capacity.

If the compressor crankcases were of infinite depth, the oil level in compressor 1 would attempt to build up in elevation to the point where the difference between levels in the two compressors provided a static head to offset the differential pressure. Compressor lubricating oils have a density which results in approximately 32-inch of static head required to offset one pound pressure difference. For the conditions noted, the theoretical elevation difference between oil levels would be 24-inch for the ¾ lb pressure difference.

Since commercially available air conditioning and refrigeration compressors do not contain crankcase depths of this magnitude, this large a variation in oil levels cannot occur. Theoretically, the oil level in compressor 2 would descend only to the point where the liquid equalizer connection became uncovered and the remaining oil would be retained in the crankcase. However, any disturbance of oil in compressor 2, such as crankcase foaming and gas turbulence caused by the sweeping action of the crankthrows, can further lower the oil level below this point by splashing oil droplets into the liquid equalizer from where it will flow to compressor 1. Furthermore, most of the oil returning from the evaporator will flow to compressor 1 due to the higher gas velocity in its

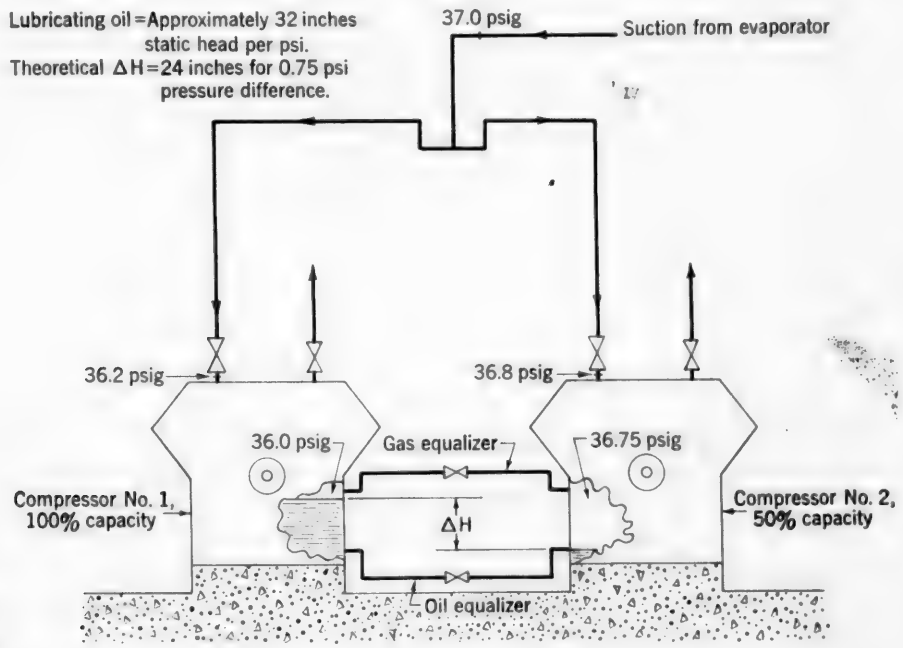


Fig. 4. Parallel compressors with crankcase equalizing lines.

branch suction line and for continuous operation, compressor 2 may become void of lubricating oil.

Good System Design

A system design which overcomes these pitfalls is illustrated in Fig. 5. An oil receiver is provided to maintain a reservoir of oil to replenish any number of compressor crankcases should they become low in oil. Crankcase floats are provided with each reciprocating compressor to maintain a constant crankcase oil level.

The oil receiver is equalized to the common suction line which is always at a higher pressure than the compressor crankcases, making a pressure differential available to force oil into the crankcases when called for by any float.

The horizontal suction trap formed by the piping illustrated in Fig. 5, or a vertical trap as illustrated in the first article of this series (October 1959), may be located in the common suction line to collect any oil returning from the evaporator. A drain line is provided at the trap to drain any oil, returning from the evaporator, directly to the oil receiver. It is suggested that a tee be provided in the oil drain line with the side outlet connection draining to the oil receiver. A short section of pipe and blowoff valve connected to the through side of the tee will serve as a scale and dirt trap. Drainage to the bottom of the oil receiver, or the formation of a liquid trap in the drain line when entering the top of the receiver, is preferred to promote better liquid drainage from the suction header. A free draining line to the top of the receiver should be avoided since gas flow in the opposite direction would, at times, retard

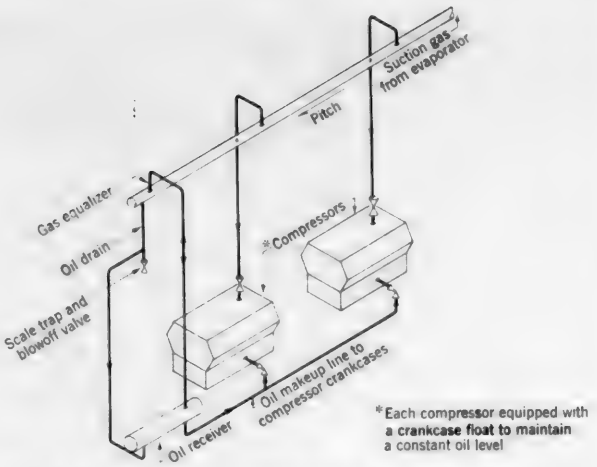

Suction gas from evaporator
Pitch
Gas equalizer
Oil drain
*Compressors
Scale trap and blowoff valve
Oil makeup line to compressor crankcases
Oil receiver
*Each compressor equipped with a crankcase float to maintain a constant oil level

Fig. 5. Parallel compressors installed with an oil receiver.

gravity flow of the liquid. A liquid connection is provided at the bottom of the oil receiver and run at floor level to each of the compressors to provide makeup oil to individual crankcases when the floats call for additional oil.

On non-oil returning type exaporators, the oil receiver may serve the dual function of an oil reservoir and oil still. A mixture of one of the halo-carbon refrigerants and oil may drain by gravity from the evaporator to the oil receiver, and by means of an electric heater or a high pressure liquid sub-cooling coil located inside the receiver, a source of heat is available to vaporize the refrigerant while retaining the oil in solution.

Priming and Foaming in Low Pressure Heating Boilers

Two phenomena that can occur in the operation of low pressure heating boilers, priming and foaming, are discussed by Water Service Laboratories in one of its series of technical bulletins.

Priming means a carry-over of boiler water into the steam main. It may be caused by a sudden increase in the load resulting from the rapid opening of large steam valves. The consequent sudden drop in boiler pressure induces an abnormally rapid rate of boiling. The likelihood of priming is increased if the steam-liberating area in the boiler is small in relation to the steam output. Carrying the water level too high in fire-tube boilers decreases the steam-liberating area. Priming happens occasionally in high pressure boilers in industrial power plants, but should be quite infrequent in low pressure heating boilers.

Foaming can occur in low pressure boilers and high pressure boilers. Foaming means the formation of a layer of bubbles of steam on the boiling water. If this layer fills up the steam space, boiler water is carried over into the steam main with the steam. Foaming may be caused by any of the following:

1. Oil in boiler water. The oil may get in because of a leaking fuel oil preheater or it may get in during the process of retubing a boiler.
2. Water level too high. When the water level is too high in a fire-tube boiler the steam disengaging surface is reduced, because of the curvature of the shell. The water may be carried too high because of inexperience or because of the necessity for submerging an instantaneous heater, or as has happened in a few cases, the gauge glass might be set too high when the boiler is installed.
3. Overload on boiler. The boiler may be too small for the load, or the oil burner too large, and the full load may come on the boiler too suddenly.
4. A high content of dissolved solids, or a high content of suspended matter (sediment or sludge) in the boiler water, or both.

A high content of dissolved or suspended solids is the cause of most foaming troubles, although the other conditions listed above may aggravate the trouble. A high content of dissolved solids is due to losses of steam or condensate which necessitates feeding a large amount of makeup water into the boiler, without corresponding blow-down. A high content of suspended matter is due in part to precipitation of the hardness in the makeup water, in part to suspended matter in the condensate, or in small part to suspended matter in the makeup water.

If foaming troubles appear in a boiler, it should be shut down, cooled, drained, flushed out and refilled, if it is possible to do so. If there are two boilers in a building, and if one is capable of carrying the load, they should be drained and washed out, one at a time. A sample of the boiler water should be examined for the presence of oil.

ACHV REFERENCE SECTION

Fan Coil Units and Systems

WILLIAM H. DIVINE

Manager, Refrigeration Sales, Engineered Machinery Division, York Division, Borg-Warner Corp., York, Pa.

Fan coil units are generally a part of a year-round air conditioning system which uses water as a heating and cooling medium. This Reference Section not only describes units and systems that are available, but it also shows how such systems can be applied in multi-room buildings. These systems are used in apartment houses, hotels and hospitals.

Fan Coil Units and Systems

WILLIAM H. DIVINE

Manager, Refrigeration Sales, Engineered Machinery Division,
York Division, Borg-Warner Corp., York, Pa.

A general discussion of the subject covering not only the equipment that is available, and the various components of these units, but also their application in fan coil unit systems for multi-room buildings such as apartment houses, hotels and hospitals.

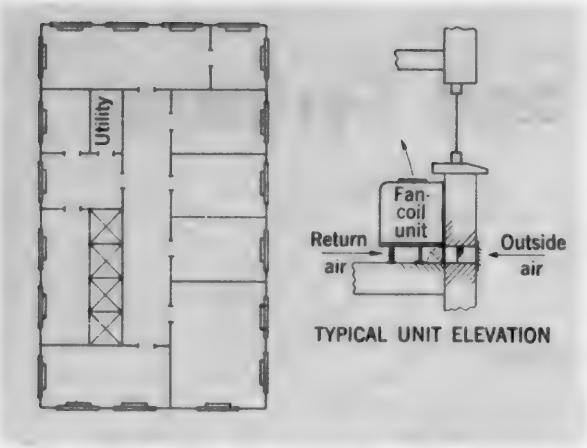


Fig. 1. Basic fan coil unit system with no interior zone.

BASICALLY the fan coil unit is a remote air conditioning unit that consists of one or more fans, fan motor, cooling and heating coil or coils, filter, and a decorative housing or casing. Generally, it is a part of a year-round air conditioning system that uses water as a heating and cooling source, and the units are installed under windows in multi-story buildings.

Units are now available with air circulating capacity from 200 to 600 cfm, in increments of 100 cfm. Larger units, up to 1500 cfm find more limited application. They are produced as a floor, and a wall mounted vertical unit, and a horizontal ceiling mounted unit. They are suitable for furring into the building structure. A normal multi-speed fan switch is part of the unit, generally available as additional accessories are thermostatic controls, pneumatically operated controls, and other items to be covered in this article.

Fan Coil Unit System

The fan coil unit system generally consists of central heating and cooling equipment, fan coil units, interior zone units, with controls, interconnecting piping and wiring as required to make up a complete system. The system in its simplest form, Fig. 1, would apply to a multi-room building without an interior zone. In this type structure the fan coil units would handle all of the air conditioning load without requiring additional air conditioning equipment. Typical examples of this type building would be apartment houses, hotels and private patient wings of hospitals. In some instances these buildings require additional equipment in lobbies and corridors but in general they will not require interior zone equipment shown in Fig. 2. Office buildings usually fall into the type building requiring interior zone treatment.

The fan coil unit system is applicable to both new and existing multi-room buildings. Generally speaking this system requires a minimum of space for its installation—it would take up slightly more room space than an existing radiation system in a building without an interior zone. In such an installation there would be no need to run duct work throughout the building as there would be with other systems.

Ventilation Air

Ventilation air for the fan coil unit systems without interior zones is usually supplied locally at each unit through an opening in the exterior wall of the building.

In the more refined fan coil unit systems, ventilation air is often supplied from the interior zone where a larger than normal quantity of ventilation air is induced into the building. In some instances, preconditioned ventilation air will be supplied to the spaces served by the fan coil units through a separate corridor duct system or sometimes even a separate peripheral duct system.

The type of fan coil unit system will be determined by

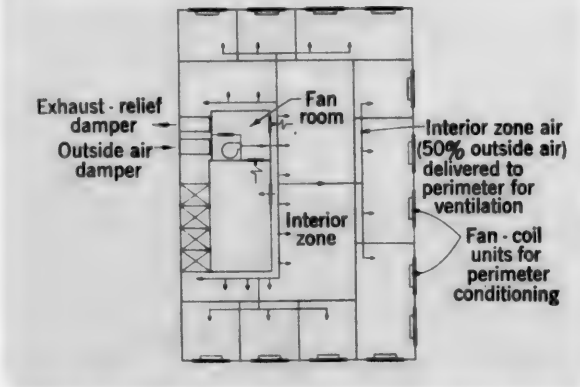

Exhaust - relief damper
Outside air damper
Fan room
Interior zone
Interior zone air (50% outside air) delivered to perimeter for ventilation
Fan - coil units for perimeter conditioning

Fig. 2. Basic fan coil unit system with interior zone.

the needs of the particular building. For example an apartment building would generally utilize a fan coil system having provisions for taking fresh air in through wall openings at each unit. This might be modified in the case of existing apartment buildings to a ceiling type installation where the units might be installed just inside the apartment on the ceiling taking ventilation air through a corridor duct system or perhaps even omitting ventilation air entirely. In the installations where ventilation air is omitted, there is usually mechanical exhaust provided for the kitchen or bathroom, or both, which theoretically at least indicates that some fresh air will be drawn into the space. The installation of fan coil unit systems, or any other systems for that matter, without provision for proper ventilation, constitutes poor practice and is definitely not recommended.

Applications of Fan Coil Systems

Fan coil units are often installed in hospitals, particularly in private patient pavilions. Better class installations of this type generally provide ventilation air through a corridor duct system where the ventilation air is conditioned at least to room design conditions. In this manner, provision can be made for pressurizing the building and providing proper filtration as well as adequate dehumidification of the fresh air. A fan coil system is applicable to either new or existing hospital buildings. In the case of new buildings the units are generally installed under the windows against the exterior wall; for existing buildings with adequate heating plants and radiation, the fan coil units generally are installed on the ceiling, either in the corridor or in the room. The fan coil unit system is applicable to serve guest rooms in either new or existing hotel buildings. The same general remarks apply to hotel buildings as to hospitals in that the existing building with an adequate heating system can generally most easily use the ceiling type installation whereas the new building would make use of the floor or wall mounted unit under the windows.

Office building application of fan coil units very often will utilize the interior zone as a ventilation air source for the area served by the fan coil unit. By increasing the percentage of fresh air used in the interior zone and making provisions for ducting the rather rich interior zone return air (from 40 to 60% fresh air initially), it is possible to provide a workable installation without a separate preconditioned fresh air system for the periphery of the building. Office buildings have been conditioned with the fan coil unit system, using through-the-wall openings at each unit for the supply of ventilation air and other ways that this system can be applied.

System Evaluation

Advantages of the fan coil system for the air conditioning of multi-room buildings are now enumerated:

Individual Temperature Control. The fan coil unit system is readily adapted for individual control in each space of a multi-room building. Simple controls are available, either manual or automatic for use with the fan coil unit system.

Flexibility. This system is more flexible than many systems in that the operation of any one unit is independent of operation of other units. For example, a number of rooms in a hotel could have the fans in their units turned off while other room units are still operating, with no affect on the operating units. This feature permits an operation saving with the fan coil unit system not possible with other systems.

William H. Divine, Manager of Refrigeration Sales, Engineered Machinery Division of York Corp. subsidiary of Borg-Warner Corp., was born in Erie, Pa. He is a member of Class of 1942, U. S. Naval Academy, Annapolis, Md. and served in the U. S. Navy until 1947. For the next three years he was with the air conditioning division of General Electric and from 1950 until the present, he has been associated with York Corp.

Gravity Heating. The fan coil unit system can maintain building temperatures during all but the most severe winter weather, without the use of fans. Most office buildings shut down the fan coil unit fans after the building is closed, and maintain a reduced building temperature through use of gravity heating with the fan coil units.

Individual Air Circulation. Of particular importance to hospital applications is the fact that the fan coil unit system does not mix air between conditioned spaces. In a hospital this feature minimizes the possibility of cross contamination between rooms. In apartment buildings this feature serves to minimize the possibility of mixing odor between apartments.

Minimum Space. This system generally requires a minimum amount of space on the building periphery as compared with other systems. In a typical fan coil unit system installation, water risers and runouts will be installed in the skin of the building with either through-the-wall apertures or interior ducting for ventilation air. In this way the architect has maximum freedom for building skin treatment. In existing buildings, the minimum space feature of the fan coil unit system is often a deciding factor in determining the type system to be used. In an existing apartment building, for example, there generally would be no reason to install overhead duct work when such an omission would mean savings because of elimination of duct furring.

Noise. The fan coil unit system is inherently quiet. It is simple to insure a relatively constant sound pressure level in the fan coil unit system as compared with a central fan system or an induction unit system. While it is true that the fan coil unit is somewhat noisier than a quiet induction unit, it is also true that the average fan coil unit is quieter than an improperly applied induction unit. There is less chance of a fan coil unit causing noise difficulty compared to an air outlet in a central fan system. With proper selection of fan coil units, the fan coil unit system will give good results from an overall noise standpoint.

Ventilation. This system is adaptable to almost any method of supplying ventilation air which the designer may wish to use. Untreated ventilation air may be supplied locally through the exterior wall, from the building corridor, ducted from a central fan, or through

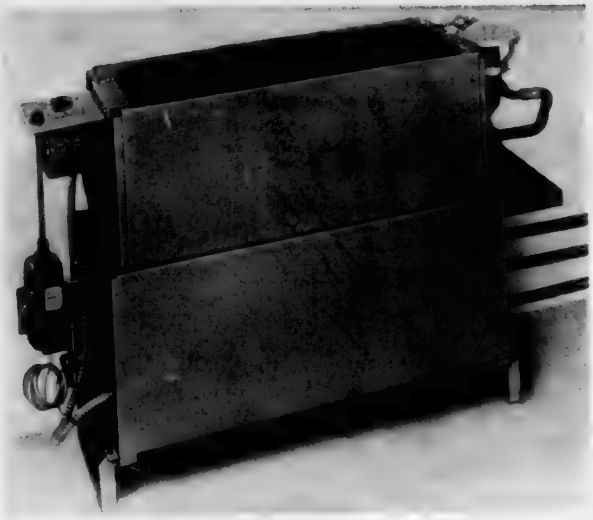


Fig. 3. Vertical type of fan coil unit.

infiltration. Preconditioning of ventilation air may be supplied in one of many ways. Ventilation air may be filtered as required.

Simplicity of System. Much can be said for the simplicity of the engineering, installation and maintenance of a fan coil unit system. In the initial concept, while the job is still on the drawing board, sufficient capacity is provided by proper unit selection to care for the heating and cooling loads of the space. In general, the fan coil unit will have more than adequate capacity to handle the space heating and cooling load for the designer specifies a minimum capacity; invariably, the manufacturer's unit size is either too large or too small for that capacity. As a result, the unit installed is usually larger than that called for by the design. As long as adequately sized clean piping is run to each of the individual units, there will be no capacity problem after installation. This presupposes that the central refrigeration and heating plants are adequately sized for the building. After the equipment is installed and operating, the unit will continue to deliver adequate capacity through its life as long as it is maintained in operating condition with clean filters, lubricated motor and adequate water circulation.

Disadvantages

Having examined the advantages of the system, then in all fairness, information should be presented on the inherent disadvantages.

Humidity Control. The fan coil unit system can be installed with provision for adequate humidity control by supplying the space with properly dehumidified primary air. When untreated air is supplied directly to the fan coil unit through a wall opening it is usual for the system to lose control of the humidity between seasons. This disadvantage of the typical system can be overcome in the design stage, but once the system is installed, there is little that can be done to correct this inherent fault. Of course, the system can be operated to over-cool the space and in that manner some humidity control can be obtained. This certainly is not satisfactory from a design standpoint.

Simultaneous Heating and Cooling. The typical fan coil unit system usually is not capable of simultaneously heating and cooling in adjacent rooms on the same zone. Generally the designer will provide for zoning so that one zone may be on heating with the other zone on cooling. On occasions, where simultaneous heating and cooling of adjacent rooms would be desirable, it may be provided by a three-pipe system or a dual coil system where both hot and cold water are available at the unit at all times.

Mechanical Equipment in Space. This system requires a certain amount of maintenance of filters and fan motors. The fan motors must be oiled at least once a year and the filters should be changed or cleaned at least twice a year. Having the fan motor in the conditioned space is considered by many designers to be a disadvantage, although this point is minimized by having units equipped with easily replaceable fan assemblies. Maintenance of equipment in the conditioned space is always a problem. However, the fact that the induction unit system, which is generally compared with the fan coil unit system, must also have substantial maintenance, is very often overlooked. Coils and/or lint screens on induction units must also be cleaned periodically. In the case of the induction unit system, this requires a vacuum cleaning operation that is anything but simple. On the other hand, the fan coil unit may require replacement of its fan deck with a minimum requirement for replacing filters and oiling fan motors.

DESCRIPTION OF FAN COIL UNITS

Types of Units

Fan coil units are of three general types—the vertical unit, Fig. 3; the vertical unit for wall mounting, Fig. 4; and the horizontally mounted unit, Fig. 5. These units may be furnished for free standing or for furred-in application. The selection is almost entirely dependent on the installation requirements. A new office building, for example, would have the units furred-in and they would likely be the floor mounted or wall mounted vertical type units. In an existing building, it is likely that free standing units would be used, quite possibly of the wall mounted type. The wall mounting enables the unit to be installed without rerunning the telephone lines and electric lines that are so often found at the baseboard in older buildings. If, in the case of an existing building, the radiation were adequate and the fan coil units were

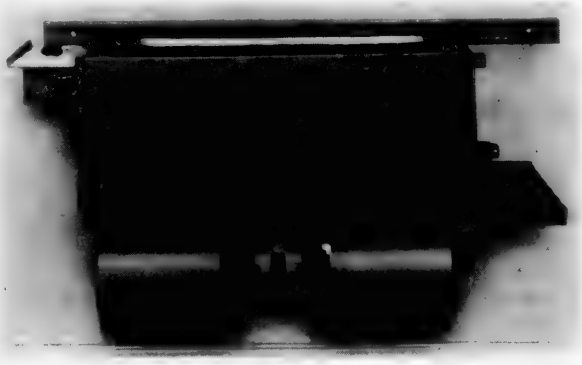


Fig. 4. Vertical type unit for wall mounting.

installed for cooling only, the ceiling unit would be given consideration as either a furred-in or free standing application, depending on the extent of the building modernization program.

Most units have provisions for handling ventilation air at the unit. In general, this air is brought in through the lower part of the unit at the back. Vertical units intended for use with local outside air supply, have a damper arrangement in the bottom of the unit which permits some adjustment of fresh air quantity. The minimum damper arrangement usually provides for about 25% ventilation air. In some equipment lines there is further provision for a more elaborate damper which will permit use of 100% outdoor air. Still further refinements are available where units have a coil air bypass which provides some degree of humidity control.

Unit Components

The fan coil unit consists basically of its supporting casing, fans, coil fan motor, filter, and a decorative casing, if provided. These components, Fig. 6, vary with the different makes so a brief discussion of component features may be helpful.

Fans

The limiting factor in determining the depth of a unit has been the fan diameter. The fan coil unit is wanted as thin as possible to take up a minimum of usable space in both vertical and horizontal applications. To achieve the noise levels required by the application, a centrifugal fan generally is used and noise level requirements determine the fan tip speed. In general, the average unit design is approximately 9 to 12 inches deep for a unit with acceptable noise level.

Fans are generally of the forward curved centrifugal type, one or two in number, although some units in larger sizes may have three or four fans. For one and two-fan units, fans generally are mounted on motor shaft extensions; units with larger numbers of fans usually have the fans mounted on a line shaft with the shaft belt driven by the motor. These larger units are being applied to school classrooms generally for heating and ventilation only. The fans are supported through the motor from the drain pan, with sound isolation installed between the pan and the motor.

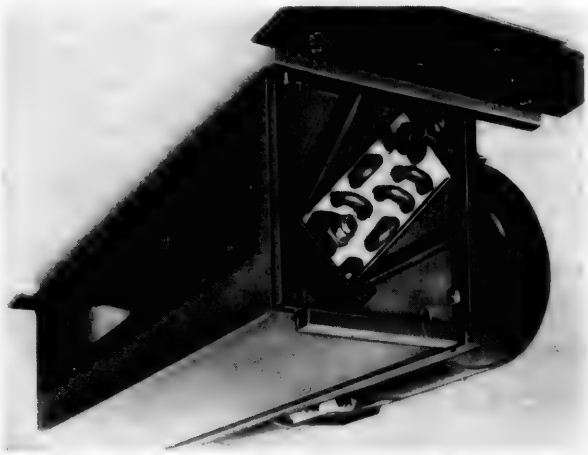


Fig. 5. Horizontally mounted fan coil unit.

Fig. 6. Component parts of a fan coil unit.

Fan Motor

The fan motor is generally of a six-pole type (1200 rpm synchronous speed), again for noise considerations. Some units use four-pole motors (1600 rpm synchronous speed) and these units normally have a somewhat higher noise level than the six-pole motored units.

Motors used in fan coil units are of two general types, the shaded pole motor and the permanent split capacitor type motor. The shaded pole motor uses a choke coil for speed regulation and, in comparison with the capacitor type motor, is somewhat less efficient. The choke coil will result in a hum that may be objectionable from a noise standpoint. The split capacitor motor generally gives better results in that it is somewhat more efficient than the shaded pole motor and it eliminates the choke coil. Speed regulation in a split capacitor motor is secured through different winding combinations. The better quality split capacitor motor is somewhat more expensive than the shaded pole motor so the designer must weigh quality and price to determine the type unit for the particular job.

Most fan units are equipped with fan motors provided with lubrication fittings, usually oiling tubes. Fan coil units, in many instances operate 24 hours a day, 365 days a year. Since starting is not frequent, heavy duty equipment is not required. The hours of service indicate the need for close attention to lubrication. Most manufacturers recommend that motors be lubricated twice a year when the filters are changed and also caution against overoiling.

Coils

The coil in the fan coil unit generally is a typical air conditioning heat transfer surface with copper tubes and aluminum fins. There usually is an effort made, as with most air conditioning heat transfer surface, to completely cover the copper tubing with the aluminum fin collars. The reason for this is to minimize the possibility of odor collection on bare copper tubes.

Coils vary in depth from two rows to four rows in direction of air flow. The type application most often using fan coil units has relatively light latent loads so the coils are called on to do mostly sensible cooling.

Some manufacturers provide an optional additional row of coil for heating, usually with steam. Some installations have been set up to use the additional row of coil for heating at the same time that cooling is available. This results in double piping systems and tends to be expensive but having the cooling and heating available simultaneously permits much better control of space conditions.

Some manufacturers publish ratings for their fan coil units using dry expansion coils for use with direct refrigerant. Applications of this type are relatively few because of the problems involved in the refrigeration circuit with a multitude of evaporators at varying distances and varying elevations in respect to the compression equipment. With the present day availability of small packaged water cooling systems, there seems little reason to use direct refrigerant in fan coil units.

The drain pan under the coil (most fan coil units are blow through type units) is generally a structural member. It is usually well insulated in order to minimize the possibility of sweating. Most units have some provision for extending the drain pan beyond the coil to include drip protection for the control valve and valve cluster at the inlet end of the coil. Since fans generally are supported from the drain pan, the pan is usually fabricated of relatively heavy metal, say 16 or 18 gage. In some units, the drain pan, along with the fan-motor combination, are readily removable from the unit without breaking the drain connection. The drain connection should be adequately sized and it is important to be sure that there is no raised edge around the drain connection. If there is a lip around the drain connection, condensate will lie in the drain pan and become an odor source. The coil is generally provided with a manual, and sometimes automatic, air vent near the top of the coil. These vents are accessible and are usually located over the drain pan permitting easy venting of the unit.

Filters

Filters for use with fan coil units are the cleanable and throwaway types. The type to use with the unit rests largely with the installation. In the apartment house installation, where the maintenance man has no time for cleaning filters, a throwaway type filter is the best choice. If a filter cleaning service is to be provided, then the cleanable type filter will be adequate. Filters are usually one inch thick and normally can be replaced without removing the decorative casing on the free standing units. In the case of furred-in vertical units, the front panel must be removed to replace filters and oil the fan motor. When fan coil units are supplied with a local source of ventilation air, the ventilation air normally is passed through the filter before going to the cooling coil. The filters used with the fan coil units are of relatively low efficiency and serve primarily to keep the unit coil clean. It is much easier to clean or replace a filter than to clean the coil.

For effective filtration, the building must be pressurized and all ventilation air submitted to thorough filtration. This can be done with a fan coil unit system using the primary air or interior air system. The filter on the fan coil unit is effective for taking out local large particle dust that is brought into the building on people's clothes and shoes. Hotel chambermaids have found the return air grille on fan coil units a very good place to shake the dust from their mops and dusting rags.

To maintain unit performance at or near design conditions, filters must be cleaned or replaced about twice a year, depending on the individual installation—in some cases with local outside air, the filters should be cleaned every month. Installations have been observed with filters blocked to such a degree that the air flow through the unit was reduced by more than 50%. This resulted in poor air distribution and generally unsatisfactory air conditioning.

Casing

There is some variation in the type of casing supplied for the fan coil unit. Some manufacturers make a unit with a basic casing and with a separate decorative casing available as an optional extra. Other manufacturers build a unit with the decorative casing acting also as the basic casing. In either instance, the casing must have provision for access to the interior of the unit.

The usual case is a fan coil unit complete and ready to operate with side panels, back panel and removable front panel painted a prime coat and ready to install in an enclosure provided by others. This basic casing is functional only, providing support for the various pieces of the unit, and access to the working parts of the unit for installation and service. The piping and controls are usually installed outside of the basic casing so that the casing provides only the stated functions. Usually the casing is insulated on the inside to minimize the possibility of sweating. The insulation provides a dual function in that it usually helps to provide a quieter operating unit. When a separate decorative casing is provided, it usually has provision for easy removal for access to the unit. The decorative casing is generally fabricated from furniture steel.

The air discharge and return grilles are a part of the decorative casing or may be installed in the unit enclosure as built into the structure. The vertical type unit is usually provided with fixed vanes in the discharge air and the return air grilles. Very often these grilles are a part of and integral with the decorative casing. In some models, double deflection discharge grilles are available as an accessory. The return air grilles are generally fixed louver type grilles stamped in the decorative casing. The decorative casing rarely has any insulation incorporated in its structure.

Most manufacturers of fan coil units provide as accessory items discharge air grilles and collars for furred-in units along with return air panels for the same type of installation. Provisions for taking fresh air into the unit locally are handled in a variety of ways. Some unit manufacturers offer wall boxes as an accessory, complete with screens and louvers for connection to the unit. These wall boxes generally are made up in standard brick sizes.

Unit Control

Most fan coil unit manufacturers provide several means for controlling the units with both field installed

equipment and with factory installed equipment.

The standard fan coil unit has a manual switch controlling the fan speed. In addition to this basic control, there is available a thermostat which may operate to vary the fan speed, a thermostat which may control a solenoid valve in the water supply through the coil, a thermostat which modulates the water supply to the coil, a self-contained valve modulating the water supply to the coil, and even bypass control within the unit.

The type of unit control selected by the designer will again depend on the quality of the installation which he is planning. The most used system for quality installation is a pneumatically operated modulating valve controlled by summer-winter thermostat. Next, from the standpoint of quality of installation, would be the self-contained valve; followed by the electrically operated solenoid valve, and the fan speed control. Of course, the operation of the unit control must be coordinated with the system control.

In addition to the control valve or device, provision must be made for shutoff valves on the water supply and return to the unit. Most manufacturers provide either factory assembled valve clusters, or drawings and instructions for the installation of such clusters. The space at the end of the fan coil unit is rather cramped by the time the insulation is put on the piping supplying the unit. In this case of a furred-in unit, this is not necessarily critical but in the case of a unit using a decorative casing, it takes a good deal of arranging to fit this equipment in within the allowed space.

PERFORMANCE

Rating

Fan coil unit manufacturers' catalogs give ratings for the fan coil units under varying conditions. The ratings are generally expressed in Btu per hour for the total and sensible cooling, with the difference between the two giving the latent capacity available at varying conditions. The units are rated basically in four popular sizes, 200, 300, 400 and 600 cfm. As pointed out, larger units are available up to approximately 1500 cfm.

Generally speaking, the 200 through 600 cfm models will give the designer adequate choice from both the standpoint of capacity and air flow to handle most multi-room building installations. The present day trend of smaller and smaller modules tends to favor the smaller unit to a degree. The thoughtful designer will notice a difference between the ratings of the various manufacturers for identical conditions and identical air flow. There has been no standardization in the air

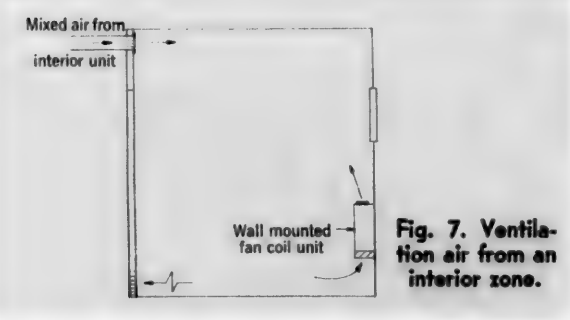


Fig. 7. Ventilation air from an interior zone.

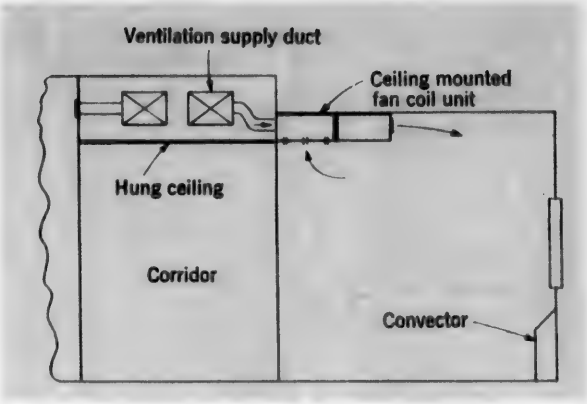


Fig. 8. Ventilation air from a corridor duct.

conditioning industry, among the manufacturers of fan coil units, and as a result there are as many methods of rating the units as there are manufacturers.

Power Consumption

There is a variance among the different makes of fan coil units in the amount of power required for the unit fan. Depending on whether the fan motor is a shaded pole or permanent split capacitor type, the power consumption will be more or less. In a small job of 50 or 100 units, the difference in power is of relatively small importance but in larger installations this difference may rapidly mount up to a sizeable sum per year because of the long hours of equipment operation.

Noise Levels

There is, at the time of writing this article, no uniformity among the fan coil unit manufacturers in regard to the matter of rating units according to the noise generated. Generally, the better the unit in quality, the quieter it will be. A slow speed fan motor with large diameter fans with proper and adequate insulation will result in a quiet unit, while a high speed fan motor with small fans without proper insulation will result in a noisier unit. There is no guide, at the present moment, to proper selection of units in accordance with standard criteria. If an installation is particularly critical insofar as noise is concerned, then the designer is advised to insist on the selection of units for design conditions at medium speed. Medium speed on a three-speed unit is usually considerably quieter than high speed.

If it is possible for the designer to tie the unit selection to a manufacturer's name and model number, he can be sure, after thorough investigation, of a completely suitable job insofar as noise level is concerned. He can also be sure that the system will continue to operate at approximately the same noise level through its life. There is little likelihood of the system becoming unbalanced or becoming noisy through fault of installation. The noise level of the unit is built in at the factory and there is relatively little that can be done to change it in the field. Worn fan or motor bearings can, and will, produce objectionable noise. This can be corrected.

Sweating

Sometimes a serious problem with fan coil unit in-

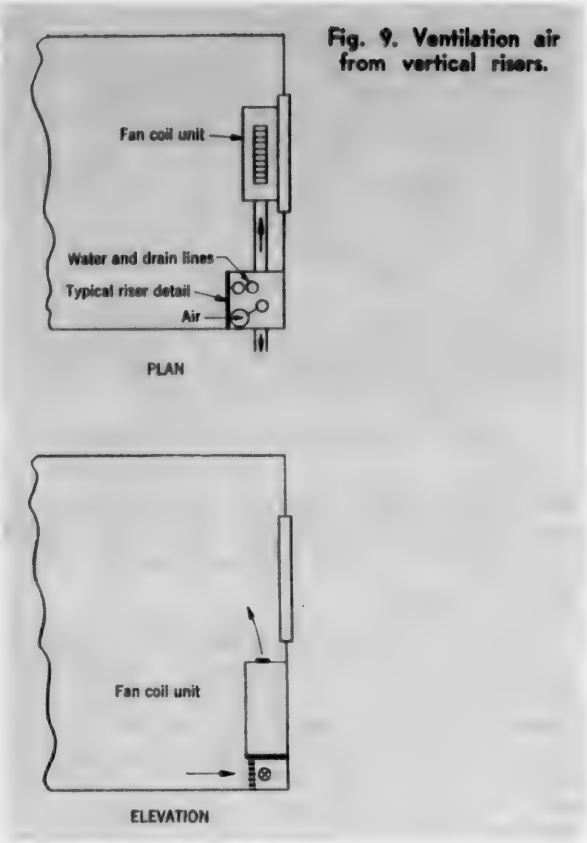


Fig. 9. Ventilation air from vertical risers.

stallations is sweating of the unit casing. The sweating occurs when the unit fans are turned off and chilled water continues running through the coil. Such a case might occur in an unoccupied apartment or a hotel room. The cold water flowing through the coil results in a reverse air circulation that drops air down through the drain pan past the fans and into the lower part of the fan coil unit. If the unit is not adequately insulated in the lower portion, it will condense moisture on the basic casing and on the decorative casing, too, under conditions of high relative humidity. Condensation has been more than annoying where expensive rugs and plaster have been damaged by the condensate. Most unit manufacturers test their equipment thoroughly in calorimeter rooms to guard against such sweating. If the unit is insulated throughout, including the lower section, the designer can be sure that sweating will be minimized.

Care should be taken in installing the units to be sure that they are level; then there is no possibility of condensate spilling out over the edge of the drain pan. This is particularly true with ceiling type units where they are harder to level and where often times the drain pan is smaller than in a vertical type unit.

SYSTEM DESCRIPTION

The fan coil unit system is quite flexible in the method used to supply ventilation air to the spaces conditioned by the fan coil unit. Ventilation air may be supplied through apertures in the outside building wall, through separate corridor ducts, through duct work to the unit itself, and several other ways to be discussed.

For best air conditioning, it is desirable to supply preconditioned ventilation air to the space in which the fan coil unit is located. The preconditioned fresh air may be programmed in a manner similar to the induction unit system; the transmission gains or losses are handled with the primary air or preconditioned fresh air. Or the preconditioned air may be tempered with outside air temperatures, with the fan coil unit itself controlling room conditions. In the latter case, simultaneous heating and cooling would not be available within a single zone as would be the case if the preconditioned fresh air was supplied in sufficient quantity and temperatures to permit this refinement.

Figure 7 shows a case where ventilation air is supplied from an interior zone. Here the fan coil unit retains control of the temperature in the space; ventilation air is supplied with the mixed air from the interior zone. This air would normally enter the fan coil unit space at some temperature in the neighborhood of 60 deg. F and this would provide some cooling as well as dehumidification in the space. This method of handling ventilation air with fan coil unit systems has been quite satisfactory in applications providing the fresh air percentage supplied by the interior zone units is relatively high—say a 50% outside air mixture entering the interior zone unit coils. The overall ventilation requirements of the spaces must be kept in mind—normally

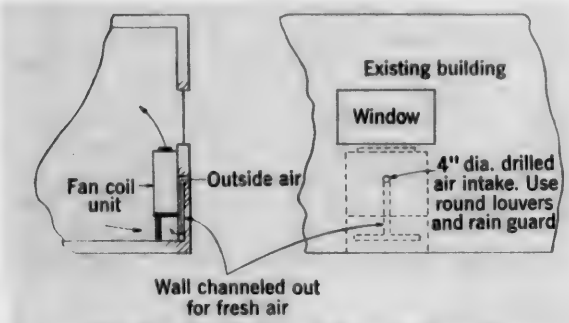

Existing building
Window
Fan coil unit
Outside air
4" dia. drilled air intake. Use round louvers and rain guard
Wall channeled out for fresh air

Fig. 10. Ventilation air through the wall.

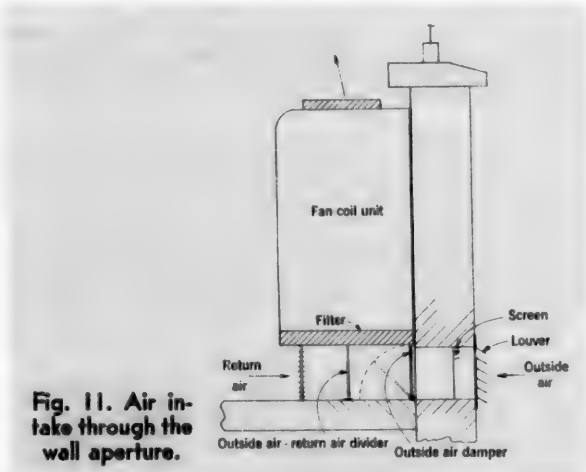


Fig. 11. Air intake through the wall aperture.

somewhere in the neighborhood of 0.25 cfm per square foot of air conditioned space.

Figure 8 shows ventilation air supplied to a horizontal type fan coil unit from a corridor duct. Air in the corridor duct could be either conditioned or not-conditioned, depending on the system design. Since a fan must be supplied to deliver the air to the fan coil units the additional cost for supplying conditioning for this ventilation air is relatively small. It does provide better air conditioning than supplying unconditioned air since it permits humidity control within limits between seasons.

Conditioned ventilation air being supplied directly to the fan coil units from vertical risers, is shown in Fig. 9. This method of supplying ventilation air to the fan coil unit system is practical but on the expensive side. With this type of supply, the vertical risers can handle the primary air or preconditioned ventilation air at relatively high pressures and velocity. If this is the case, space may be saved on the exterior of the building by using smaller duct work. However, this will necessitate some sort of sound treatment at the point where the air is delivered either to the unit or the room. Fan coil units generally are not provided with sound attenuating devices as would be necessary with such a system.

Figure 10 shows ventilation air supplied through a wall aperture. This is one of the more usual methods of supplying ventilation air with a fan coil unit system that is part of the lowest cost installations. This method of supplying ventilation air has drawbacks in that during between-season weather, control of humidity can readily be lost unless the space is overcooled. Difficulty may also be experienced with cold floors in cold weather. The possibility of over-ventilation through stack effect is also present. With proper design of the wall aperture and with provision for good damper control in the unit, this type installation will provide generally satisfactory results although the fan coil unit system is capable of better performance is outlined in the preceding methods of handling ventilation air. With the through-the-wall aperture, it is possible to supply 100% outdoor air during between-season operation. Some of the desirability of this feature is overcome by the necessity of providing and maintaining automatic damper operation. Manual damper operation is not satisfactory for such applications.

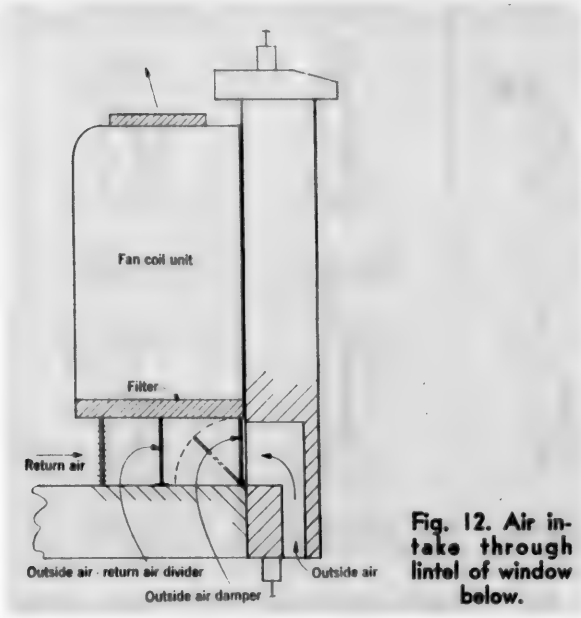


Fig. 12. Air intake through lintel of window below.

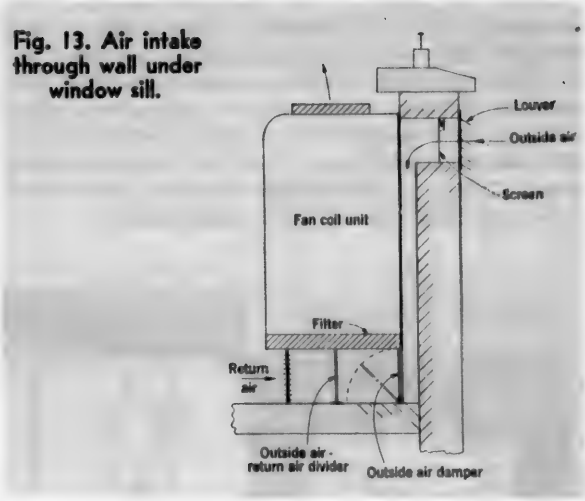


Fig. 13. Air intake through wall under window sill.

In school room application, the fan coil units are controlled to make maximum use of outdoor air for ventilation and for temperature control purposes. The majority of fan coil unit systems applied to schools have been for heating and ventilating with no provision for complete air conditioning. There is evidence of a trend toward year-round air conditioning of schools. In colder climates, the fan coil unit system seems well suited for this.

There are several methods of treatment of the through-the-wall aperture as shown in Figs. 11, 12 and 13. Many architects consider that louvers on the outside of a building are unsightly. This can be overcome by taking the outdoor air up vertically through the lintel of the window below. In the case of buildings with the modern curtain wall construction, similar provisions may be made for the fan coil intakes.

Fan coil unit systems have also been supplied without positive means for introducing ventilation air into the space. Hotel rooms and apartments which are provided with exhaust ducts will sometimes depend on the infiltration of outdoor air to provide ventilation for these spaces. This method of application in the fan coil unit system does not fall under the definition of air conditioning since the ventilation is not controlled.

Unit Location

Fan coil units can be located in almost any conceivable spot. Figure 14 shows a few of the possible locations as illustrated by one manufacturer.

Generally speaking, the fan coil unit system in new construction, will have the units located under the windows except in the very warmest climates where the units may be located overhead near the corridor. The under-window unit location is favored to minimize the down draft from exterior walls and glass during cold weather. Usual practice in a locality will determine whether an under-the-window type installation is required. Often double glazing of windows will permit the elimination of the under-the-window unit, permitting the unit to be located in a more economical ceiling or corridor area.

Location of units above the bathroom and in the tops of closets is also quite practical. When locating a unit above the bathroom, care must be taken to insure that the return air is taken directly from the room rather than from the bathroom, both from the standpoint of odor control and the possibility of excessive moisture from the bath causing condensation. It is also wise to examine closet locations to make sure that the closet is not likely to be completely blocked by hanging clothes.

Since maintenance is a consideration in any air conditioning system application, the designer should be aware of the increased difficulty in maintaining a ceiling-mounted fan coil unit as opposed to a wall or floor mounted unit. Normally, a ceiling mounted unit is provided with an access panel to permit oiling the fan motors and changing the filter. Referring again to Fig. 14, the preferable wall or floor location of the unit would permit vertical air discharge from the unit rather than

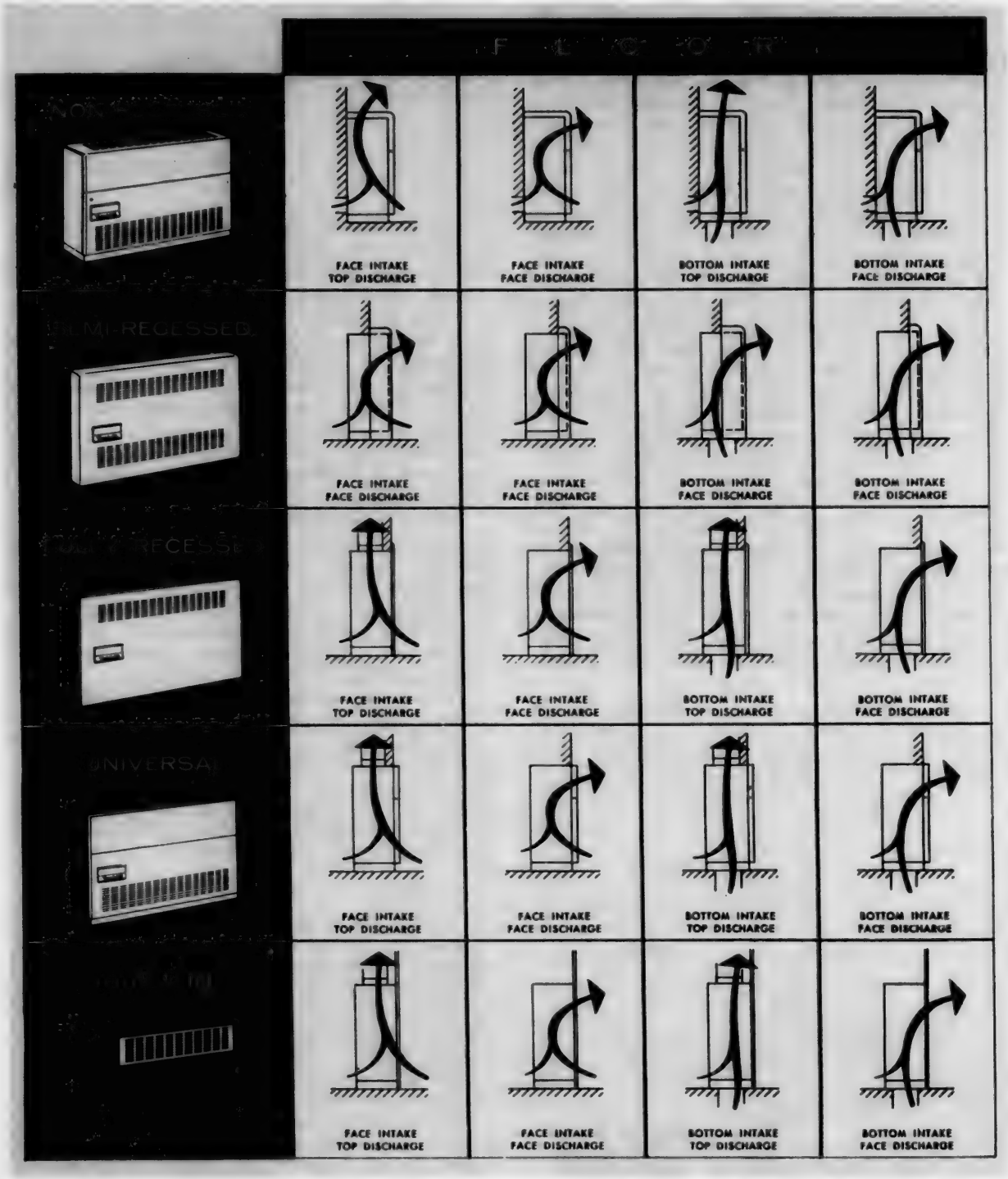


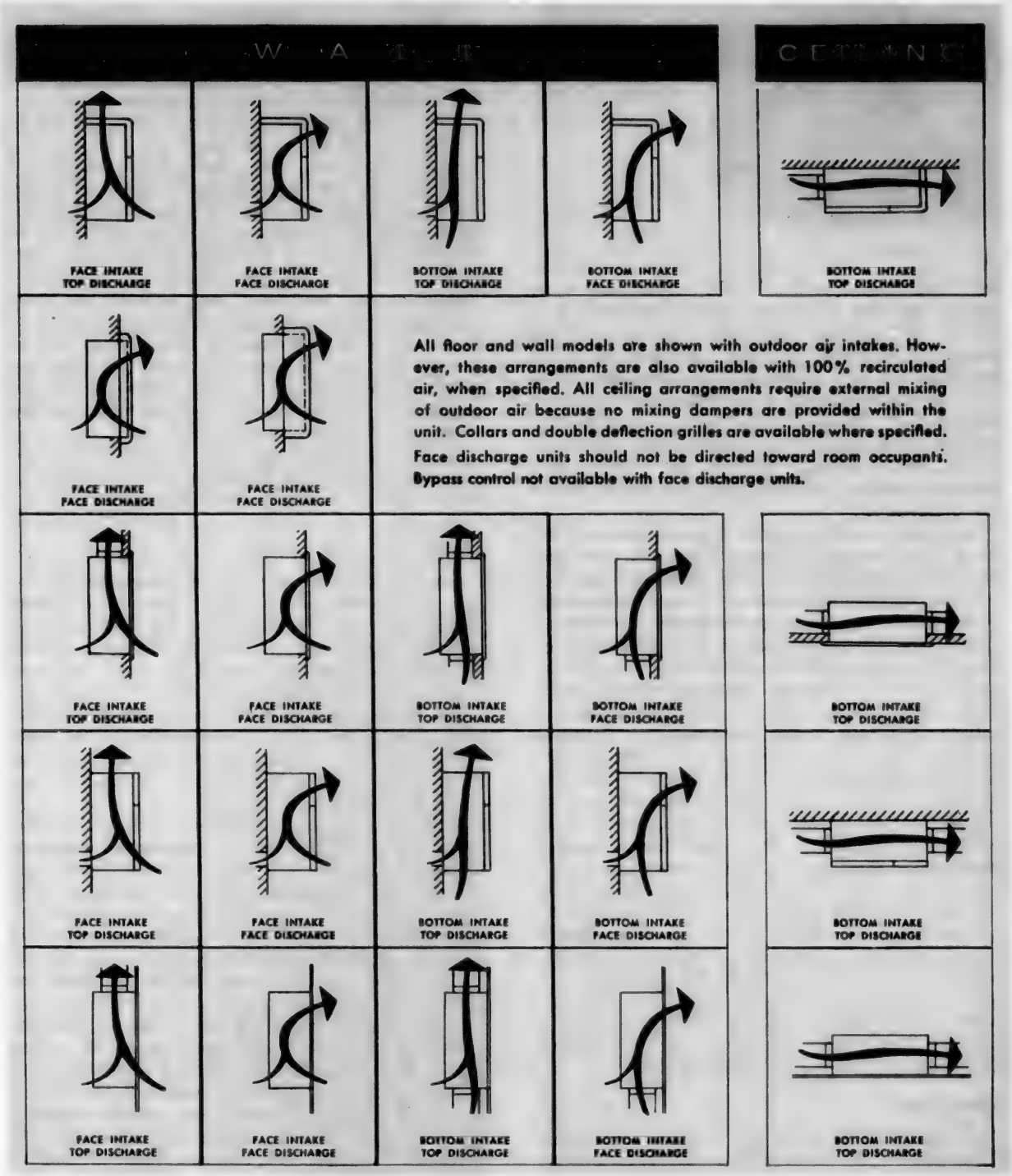
Fig. 14. Illustrations of some of the possible locations

the face discharge as is shown in a number of the illustrations. The air discharge from the face of the unit is likely to create difficulty with drafts on the room occupants. The face discharge also, unless directed sharply up, may result in some stratification within the space.

Unit Control

There are almost as many ways to control fan coil units and fan coil unit systems as there are methods of installing them. The unit itself is capable of fan speed control, cycling fan, water flow modulation, off-on water flow and various combinations of these methods of control. The system control can have many variations.

Figures 15 through 17 illustrate typical fan coil unit controls. Figure 15 shows the manual three-speed fan switch available with most units. Control not shown is the manually controlled water valve with an indicating element to mark the direction to turn the valve wheel,



of fan coil units. Courtesy of John J. Nesbitt, Inc.

Fig. 15. Three-speed fan switch.

depending on whether there is hot or cold water in the piping. Available is a manual fan speed switch along with an electric switch with built-in automatic seasonal changeover, controlled by a thermostat bulb mounted in the return air stream. This provides automatic cycling of the water solenoid valve at preset fan speed. A typical self-contained automatic water valve with automatic changeover from summer to winter operation is shown in Fig. 16. A pneumatic control valve, Fig. 17, on a ceiling counted fan coil unit, again provides modulated water flow for both summer and winter operation.

In addition to these methods of control there are still others. One example is where coil unit fans are cycled by a wall thermostat. It is particularly important here to be sure that the thermostat controlling the fan cycling (on-off operation) is wall mounted since a thermostat control bulb in the unit would work until the unit was turned off at which point the cold air from the coil would fall down on the thermostat bulb thus preventing the fan from coming back on. Also, to be taken into consideration in the unit controls, is the requirement for minimizing the possibility of the fan coil unit cabinet sweating through the continuation of cold water flow while fans are turned off. The gravity flow of cold air from the coil will chill the fan coil unit cabinet and as humidity builds up into the space, the condensation is likely to cause damage to floors, rugs and perhaps plaster in the spaces below. It is advisable, therefore, to shut off fan coil units in spaces which are to be unoccupied for an extended period of time. Not only should the fans be shut off, but also the circulating water to prevent condensation damage. Most manufacturers supply unit control kits that can be shipped separately or mounted at the factory. These control kits are generally worthwhile from the contractor's standpoint since they simplify installation of the control at minimum cost.

System Control

The control system for the fan coil system installation is dependent on the type application, the quality of the installation, and the many other considerations that normally go into a decision of this type. The usual fan coil unit installation in a multi-room building would provide some sort of fan coil unit control of either water or fan speed, with perhaps some zone control, depending on the orientation and exposure of the various zones of the building. Certainly for winter operation, variation in water temperature would be controlled in accordance with outside air temperature.

If the fan coil units were provided with modulating water control, it would not be necessary to zone the building. Normally the system would operate at design water temperature during the summer, with varying water temperatures during the winter. In the event that the individual unit water control were omitted and the units provided only with manual fan speed control, zoning of the building probably would be indicated.

The type of ventilation air supply used with the fan coil system will have a bearing on the type of control used with the system. For example, if the fan coil units were provided with through-the-wall apertures for ventilation air supply, then solenoid control of the water flow through the units would not be desirable. The on-off operation of the water flow during the heating season would permit overcooling of the room during periods of low outdoor air temperature when the water was turned off. With interior zone supply of fresh air, zone control of the fan coil units is somewhat more feasible since the fan coil unit is not in complete control of the room temperature conditions and a wider variation in fan coil unit capacity can be tolerated, thus generally permitting manual control of the fan unit speed.

It is not considered desirable to vary summer water temperatures within the fan coil system above about 55 deg in order to avoid losing humidity control.

Piping

Supply and return water piping systems used in fan coil unit systems are typical of multi-room building piping application. A reverse return system in the hot and cold water system is desirable if there is manual control of the water flow through the units. A reverse return system will simplify the problem of balancing and will insure that the system stays in balance after installation. If automatic controls are provided on the water system, the reverse return may be eliminated, providing the maximum differential across any one unit does not exceed approximately 25 psi.

Particular attention should be paid to the drain piping on fan coil systems. Again, the amount of condensate expected from the fan coil unit system will vary depending on the type of ventilation air supply provided. With the fan coil unit system handling the entire dehumidification of the ventilation air, as well as the space, there will be a substantial amount of condensate from the unit. If, on the other hand, the system utilizes ventilation air through an interior zone system, there will be very little, if any, condensate collected during the normal operation of the units. Inspection of operating systems has verified the fact that with an interior zone fresh air system, there will only be a few drops of condensate in the fan coil units pans during the most severe summer weather. Therefore. the drain lines must be adequately sized (not less than ¾ inch on each unit) and should be setup to permit easy cleanout. Since on some systems there is relatively little condensate flowing, it may become neces-

sary after a period of years to rod the unit drains to the drain risers. Depending on local codes, risers are generally drained to open funnels or stop sinks.

When the fan coil unit is installed free standing with its own cabinet, the piping must be kept quite compact in order to permit installation of the cabinet. With a furred-in type of installation, more space is available and the piping can be somewhat less crowded. However, it is still desirable to keep the control valves and the shutoff valves over the drain pan extension, if possible. Otherwise, these valves must be insulated in order to minimize the possibility of condensate dripping on the floor.

Experience indicates that it is desirable to provide shut off valves on each riser so that the riser may be isolated from the remainder of the system. Being able to isolate the riser provides ease of maintenance and also may permit part of the system to be put into operation before the remainder of the system. Each riser should also be equipped with a dirt log and a drain valve.

Piping practice indicates the use of copper up to and including 3⅛-inch OD, with steel for larger sizes. Larger copper sizes can be used but cast fittings tend to be troublesome and they are all that is currently available in these sizes. Wrought or forged fittings are available up to and including the 3⅛-inch size and are satisfactory.

It is suggested that each unit or each group of units on a runout be provided with shutoff valves on both the supply and return water lines. A bypass valve around the pneumatic or self-contained modulating water valve is helpful in cleaning out the system after the initial installation. Some trouble has been experienced in having construction dirt jam up these valves when systems are first put into operation. A bypass valve around the automatic control valve will permit system clean-out after installation, and will pay both the owner and the contractor dividends in a smoother operating system.

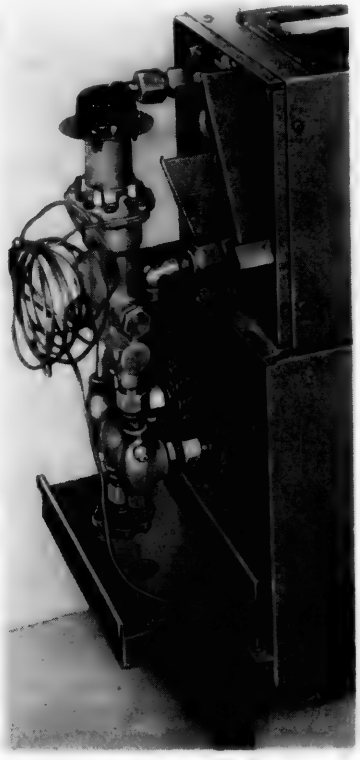


Fig. 16. Typical self-contained automatic water valve with automatic changeover from summer to winter operation.

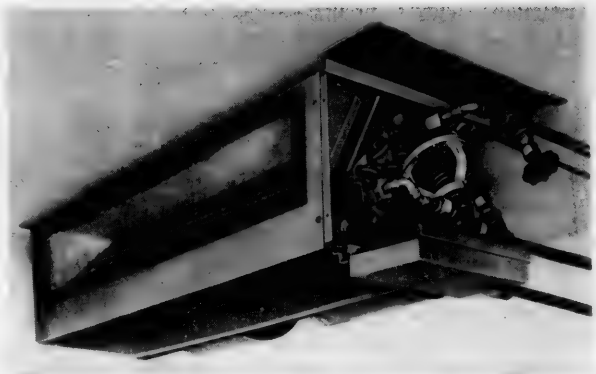


Fig. 17. Pneumatic control valve on a ceiling mounted fan coil unit.

Wiring

Most fan coil units are equipped with inherently protected fan motors furnished for 115-volt single phase 60-cycle network. Therefore, there is no need to fuse each unit. On existing buildings, the usual practice is to drive the fans from the building lighting circuits with the circuits brought back to a central panel board on each floor of the building as a minimum. In some installations, the fan coil units are kept on a separate circuit with these circuits brought to a central panel board at the building air conditioning operating station thus permitting the building operator to turn off all the fan coil units from a central point. These separate circuits should be 15 amperes each, with the total fan coil unit nameplate amperage limited to approximately 12 amperes. The designer should check local electrical codes to be sure of the type connections permitted between the wiring circuits and the units. In some instances BX cable is required to be brought into the unit, while in other cases, it is permissible to use a conventional convenience outlet with the unit cord plugging into the outlet.

Some office building operations have the cleaning people turn the fan coil units off as they go around the building. Office occupants turn the units on in the morning when they come in. Generally this type of building is equipped with an interior zone permitting maintenance of minimum temperatures with the interior zone equipment. Common practice in hotels is to have the cleaning people turn the fan coil units off, at least during the cooling season. The bellboy then turns the unit on when checking the guest into the room.

Insulation

The usual insulation requirements apply to the fan coil unit system as they do to most other systems.

A common material in current use for insulating the runouts to the fan coil units in a tubular type rubber (or other composition) insulating material. This material should be slipped on to the piping (usually soft copper); not slit and then pasted on the piping. Experience has indicated that a tight vapor seal is required on this piping. If the rubber tubing is slit in making the application, it is likely that it will not be vapor tight and it may have to be replaced. In such cases the replacement of the insulation is relatively minor—the major cost and incon-

venience comes from the replastering and redecorating along with the replacement of rugs.

Installation of Fan Coil Units

One extremely important adjunct to the installation of the fan coil unit system is the "mock-up." Experience has indicated that there is no substitute for the mock-up in securing a successful fan coil unit installation. No matter how simple the application appears, it is still extremely wise for the designer to require as a basic part of the specifications that a mock-up be built in a convenient location so that all of the suppliers involved can see the actual installation of the unit under job conditions. Building a mock-up has very often saved the parties concerned many dollars in both time and material. The mock-up should be a minimum of one complete module.

It is preferable to use the actual building for this trial installation but should this not be practical, it will still be found worth the time and money to construct the section necessary for this trial installation. Faithful adherence to both the architect's and engineer's plans and specifications, are necessary for the success of the mock-up or trial installation.

LOAD CALCULATIONS

It is suggested that the designer give serious consideration to the use of the Air Conditioning and Refrigeration Institute's method of calculating both the block and the module loads for the application of fan coil unit systems. One of the major problems that has occurred in the application of fan coil unit systems to multi-room buildings, particularly 24-hour occupancy buildings such as apartments and hotels and hospitals, is that the refrigeration system is generally over-sized for the actual load imposed upon it. It has not been at all unusual to find after very careful and serious study of load calculations, that a 600-ton installation will never have a load of over 450 tons imposed on the central refrigeration system. A refrigeration system's operating cost per ton of refrigeration delivered is higher at less than design loads. Then too, if a 600-ton refrigeration system is installed, its minimum capacity will be in the neighborhood of 60 to 100 tons which, when the system is found to have an actual maximum load of 450 tons, represents then almost 25% of the load rather than the 10% that would normally be expected. It is also a well known fact that the difficulty in operation of an air conditioning system occurs at low load points rather than design points.

Everything indicates that every effort should be made to calculate as realistic a load as possible particularly on buildings with 24-hour occupancy. ARI Form 560 is an attempt to correlate the experience of a number of firms in air conditioning various structures. It is recommended that the designer give serious consideration to the use of this ARI form in the calculation of both the block and module loads for the fan coil unit system.

Fan coil unit selections may be made from manufacturers literature although, as suggested previously, for the best quality installation, the fan coil unit should be selected on medium speed in order that the system will be quiet operating. This suggestion would be particularly applicable to 24-hour occupancy buildings in relatively quiet locations. In the event that the location of the building is in a noisy section of the city, some thought should be given to the masking effect of the constant low pitch fan sound.

Air Distribution

The fan coil unit system provides several problems in air distribution, none of which are particularly difficult to solve. With the typical perimeter installation of fan coil units, having the unit mounted either on the floor or on the wall under the window, it has been found that the most practical type of air distribution is vertically upward from the unit. Double deflection grilles are not recommended for this purpose but rather a 90 deg bar type grille with the grille bars running perpendicular to the long dimension of the unit. Originally this type of installation was made with a fan spread air discharge with the objective of blanketing the exterior wall with air from the unit. Since drapes, venetian blinds, pilasters and other obstructions so often interfered with this fan shape pattern of air, the vertical column distribution now recommended was found to be more satisfactory. The vertical air distribution has been found to spread out very nicely in blanketing the exterior wall and to travel along the ceiling for a distance of 15 to 20 ft before beginning to fall toward the floor in return circulation.

Front air discharge grilles are not suggested, but if their use is unavoidable, it is urged that the air be deflected as nearly vertical as possible to avoid drafts on room occupants, and stratification during the cooling season.

The fan coil unit is normally considered adequate for zone depths of from 15 to 25 ft. The actual depth of the perimeter zone will depend to a degree on the configuration of the building and the type of interior zone treatment used. Where the interior zone is supplying ventilation air for the fan coil unit system, the perimeter zone will generally be fairly shallow say 10 to 15 ft. In cases such as apartment buildings and private pavilions of hospitals, there may not be an interior zone in which case of course the fan coil unit would cover the entire room or apartment depth.

Refrigeration Selection

The fan coil unit system is adaptable to essentially any type of refrigeration system supply in chilled water for summer cooling. Generally, a heat exchanger is provided to heat the water for winter operation and often the same heat exchanger may be employed to furnish heat for one zone while cooling is supplied to another. The selection of refrigeration equipment is largely at the discretion of the designer. Reciprocating water cooling systems will probably be used up to 200 tons with centrifugal equipment being used from 75 tons to almost unlimited sizes. Absorption equipment is also available for providing chilled water to fan coil unit systems.

Attention is directed to the very wide range of capacity required by the fan coil unit system. The refrigeration system should be selected to provide the lowest capacity possible since the system must operate under very low loads.

A new development should also be considered by the designer. A fan coil unit is particularly well adapted to the relatively low hot water temperatures available with central heat pump systems. It is, therefore, suitable to apply a fan coil system to a central heat pump system.

ESTIMATING GUIDE FOR SPECIFIC APPLICATIONS

AIR CONDITIONING AND REFRIGERATION

Two prior data sheets gave short-form engineering and pricing data to facilitate, with a minimum of effort, a determination of the economic soundness of *any* air conditioning or refrigeration installation. In this month's data sheet is commenced the tabulation of like data, but for specific applications. All data in this series are based on data supplied by York Corporation, York, Pa., subsidiary of Borg-Warner Corporation, and, unless specifically noted to the contrary, are based on 1957 price estimates.

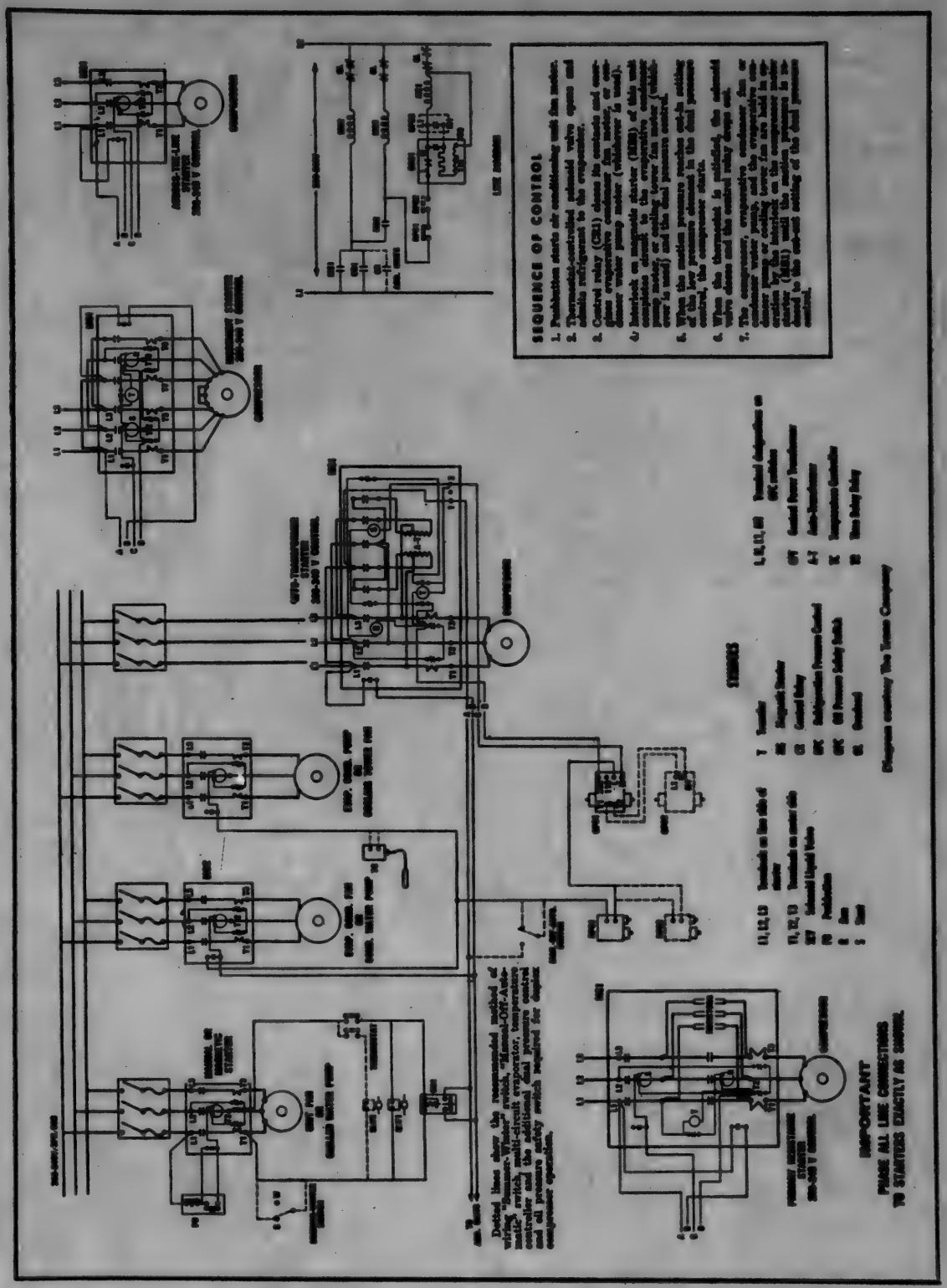
Application	Engineering Data	Pricing Guide
1. Apparel Stores	200 to 400 sq ft floor area per ton refrigeration.	$600 to $1,000 per ton for complete bill of material.
2. Automotive	Follow data in October Reference Data Sheet.	Follow data in November Reference Data Sheet.
3. Bakeries (a) Dough Mixers	2 tons refrigeration per 1000 lb bread per hr. 400 lb water per 1000 lb bread per hr for ingredient water delivered at 35 deg F.	$800 to $900 per ton from 10-25 tons capacity for complete bill of material.
(b) Fermentation Rooms	1,000 sq ft per ton refrigeration; 78-80 deg db and 80% rh.	Follow data in November Reference Data Sheet.
4. Banks	200 to 350 sq ft floor area per ton.	$600 to $1,200 per ton for complete bill of material.
5. Barber and Beauty Shops	150 to 300 sq ft floor area per ton.	$500 to $800 per ton for complete bill of material.
6. Beverages (a) Soft Drinks	33-40 deg final chilled water temperature.	$800 to $900 per ton from 10-25 tons capacity for complete bill of material.
7. Breweries	Beer and wort coolers operate at approximately 45 psig suction (NH_3). Storages operate at approximately 20 psig suction (NH_3).	
(a) Up to 500 barrels per day output	2.16 barrels per ton refrigeration.	$230 per barrel for refrigeration system. $500 per ton for the refrigeration system.
(b) From 500 barrels to 1500 barrels per day output	2.50 barrels per ton refrigeration.	$180 per barrel for refrigeration system. $450 per ton for the refrigeration system.
(c) From 1500 barrels to 3000 barrels per day output	3.00 barrels per ton refrigeration.	$133 per barrel for refrigeration system. $400 per ton for the refrigeration system.
8. Chemical (a) Chlorine	Wet gas cooling requires 1.25 tons refrigeration per ton of chlorine per day. (Cooling from 160-60 deg). Chlorine condensing requires an additional 1.25 tons of refrigeration per ton of chlorine condensed per day.	$600 to $800 per ton for refrigeration system.
(b) Plastics	Press requires maximum 60 deg water. Press equipped with 160 gpm circulating pump. Cooling cycles vary from 5-20 min.	$400 to $500 per ton for registration system.
9. Cold Storage Warehouses (Limited to 500,000 cu ft room volume.)	Figure 1 ton refrigeration per 500 sq ft floor area or 5,000 cu ft room volume based on 4-inch insulation, 6-inch insulation and 8-inch insulation for 35, 0, and —20 deg rooms respectively. Figure 75% total volume available for storage space and 25% for aisle and air circu-	(a) For 35-deg rooms over 50,000 cu ft room volume: Refrigeration system = $0.20 per cu ft Insulation = 0.30 per cu ft Building construction = 0.75 per cu ft Complete installation = $1.25 per cu ft

Application	Engineering Data	Pricing Guide
	lation spaces. Provide 1 linear foot 2-inch pipe per 17 cu ft room volume, 35-deg rooms. Provide 1 linear foot 2-inch pipe per 8 cu ft room volume, 0-deg rooms. Provide 1 linear foot 2-inch pipe per 5 cu ft room volume, —20-deg rooms.	(b) For 0 deg rooms, over 25,000 cu ft room volume: Refrigeration system = $0.30 per cu ft Insulation = 0.40 per cu ft Building construction = 0.75 per cu ft Complete installation = $1.45 per cu ft (c) For —20-deg rooms, over 25,000 cu ft room volume: Refrigeration system = $0.30 per cu ft Insulation = 0.50 per cu ft Building construction = 0.75 per cu ft Complete installation = $1.55 per cu ft
10. Dairies (a) Ice Flakes	8 lb per iced crate. Ice every other crate.	$1,000 per ton refrigeration for refrigeration system. $1,500 per ton ice for refrigeration system.
(b) Ice Cream	13 tons refrigeration for complete plant per 1000 gal ice cream per day. 3.5 tons refrigeration per 100 gal ice cream frozen per hr. 0.33 tons refrigeration per 100 gal ice cream hardened per day. 1 linear foot 2-inch pipe per cu ft hardening room volume. Size of hardening room determined at 3 times peak load based on 16 gals per sq ft floor area; includes allowance for aisle space.	$800 to $1,065 per ton. $2,800 to $3,735 per 100 gal ice cream frozen per hour. $265 to $365 per 100 gal ice cream hardened per day.
(c) Milk Storage Rooms	150 sq ft floor area per ton (35-40 deg). 75% useful room volume, 25% for unit, aisle, and air distribution.	$1065 per ton for refrigeration system.
(d) Plate Type Exchangers, Raw Milk Cooling	———	$225 per 1000 lb milk per hr for plate unit, fob factory.
11. Department Stores	Basement—2.5 to 3.5 per ton per 1000 sq ft floor area. First floor—3 to 5 tons per 1000 sq ft floor area. Upper floor—2 to 3.5 tons per 1000 sq ft floor area.	$500 to $800 per ton—cooling. $125 to $175 per ton—addition for heating.
12. Drugs, Pharmaceuticals (a) Drying	Batch process:—Load usually starts at 500 microns pressure and finishes at approximately 90 microns pressure. Modern trend is to start at 18 microns (—65 deg) and finish at 4 microns (—85 deg). Temperature equivalents are —13 deg and —40 deg respectively, 60% first 5 hr and 40% next 15 hr. Water vapor condensing load including losses figured at 1500 Btu per lb.	Refrigeration system—$2500 per ton.
(b) Shell Freezing	Based on bath —40 deg or lower.	Refrigeration system—$2500 per ton.
(c) Laboratory and Preparation Rooms	Usually figured 80 deg db—45-50% rh.	Follow data in November Reference Data Sheet.
(d) Processing and Packaging Rooms	80 deg db—10 to 20% rh.	Complete bill of material—$1000 per ton.
(e) Storage Rooms	Before drying —40 deg; after drying 80 deg and 50% rh.	—40 deg—Complete bill of material—$3500 per ton. (80 deg and 50% rh, use data in November Reference Data Sheet).

(Continued next month)

WIRING DIAGRAM—REFRIGERATION COMPRESSORS—3

Single or Duplex Compressor, Evaporative Condenser or Cooling Tower, 208-240 Volts

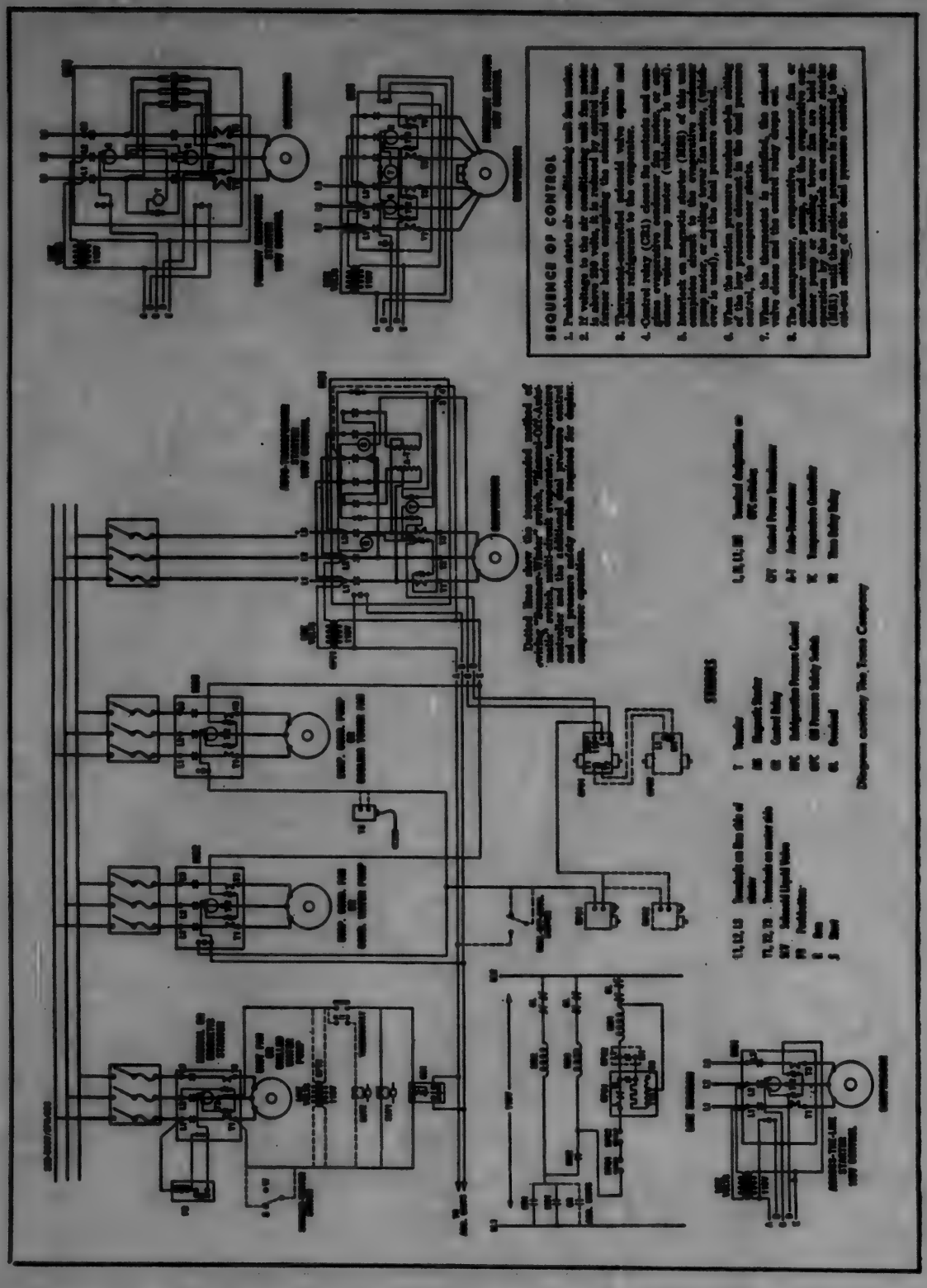


DETAIL SHEET—AIR CONDITIONING, HEATING AND VENTILATING

December, 1989

WIRING DIAGRAM—REFRIGERATION COMPRESSORS—4

Single or Duplex Compressor, Evaporative Condenser or Cooling Tower—380-550 Volts



DETAIL SHEET—AIR CONDITIONING, HEATING AND VENTILATING

December, 1959

Consulting Engineers Urge End of Free Engineering

Problems of vital interest to consulting engineers, including safeguards for the profession and improvements in practice, were discussed during the semi-annual meeting of the Board of Directors, Consulting Engineers Council.

FREE engineering, fees, and discussions of various phases of professional ethics all had important parts in the program of the semi-annual meeting of the Board of Directors, Consulting Engineers Council at Cincinnati, Ohio, November 5 to 8. Meetings were held at the Cincinnati Club and the Engineering Society of Cincinnati.

A study is being made of the fee structure of consulting engineers so that a recommendation can be made at a later date for a system to be followed. It is not believed possible to establish a national fee schdule.

Free Engineering

Joe Williamson, Jr., presented his report on Free Engineering, a subject of great concern to the engineers present. In his report he mentioned that it is considered unethical to conceal the cost of professional services. A request is made that whenever professional services are given, they be set out in their proper values. If this practice is followed, then nothing more will be required to eliminate the unsatisfactory procedure that exists in some areas.

Also reported was the practice of a package deal which includes a manufacturer, free engineering service, and a manufacturer's agent. An engineer should be frank with his client and inform him of any affiliation that may exist between him and a manufacturer or a contractor.

There was considerable discussion on the Williamson report and the group decided that this report be referred to the committee.

The subject of free engineering was brought up at another session when the results of a letter survey were reported. Letters were sent to 71 manufacturers of heating and air conditioning equipment and 44 replies were received. The letters received indicated that there is a growing awareness of the feeling of consulting engineers regarding this touchy subject. Manufacturers indicated a willingness to cease and desist free engineering service. Parts of letters received from the following companies were read: Chicago Pump Co., The Trane Co., Carrier Corp., and American Blower Co. A suggestion was made that negotiations be continued with one company with the objective that it agree to discontinue free company engineering.

Elmer C. Anderson, assistant secretary, Assurety Association of America, addressed the meeting and explained what the association is, what it does, and what it proposes to do. This association was formed in 1908 to stabilize conditions which were bad at that time. In working with the American Institute of Architects, the institute was advised to form up a contract between the contractor and owner. His association, he said, would be willing to work with the consulting engineers, to develop a suitable surety contract. He explained that surety is not insurance.

Washington Contact

Ralph M. Westcott, president, Consulting Engineers Council, reported that the council had secured the part time services of Lyle W. Jones to serve as a Washington contact. A report was given on what had been accomplished thus far by Mr. Jones.

At present the council is trying to gather information which will be used in presenting the case of the consulting engineer before the proper government officials. The council would like to give reasons, supported by facts, that it is more economical and efficient for the government to use the services of outside consultants as opposed to government personnel. Supported by facts, the council would like to show the comparative results of quality and productivity of government personnel as compared with private industry. In relation to costs, the council would like to show through specific instances, how the quality and the construction costs of comparative projects or components of a project line up when a project designed by the government engineers is compared with that done under the supervision of outside consultants.

George W. Poulsen, Jr., reported for the Documents Committee. This committee is drafting recommended forms for the consulting engineer covering comprehensive contracts, architect-engineer contract forms, owner-engineer contract forms and others. These are now being checked for legal points. The committee reported that it cannot understand why large offices insist on preparing their own forms since the preparation of such forms requires specialized information in a field foreign to that of engineering. In most cases, such forms not properly prepared tend to confuse both the bonding company and the contractor.

A Manual of Consulting Practice is being prepared and it is expected that this volume will be issued sometime during the Spring.

At the luncheon meeting, G. N. Nordstrum, a tax consultant of Cincinnati, gave a talk on Taxes and Their Effect on Engineer Partnerships and Corporations. At the dinner meeting, the speaker was Gale Hathaway, engineering consultant, International Bank for Reconstruction and Development.

Engineers Council

Plans are now being made for the fourth annual meeting which will be held probably on May 3 to 5, in the vicinity of Oregon. The city has not been definitely decided. Co-hosts of this meeting will be the Oregon, Washington and Montana societies.

LOUIS BLENDERMANN ON

PIPING AND PLUMBING

Indirect Waste Receptors

AN important part of plumbing systems in buildings is the indirect waste piping that is installed for certain types of fixtures and equipment. An indirect system of waste piping is one that is not directly connected to the building's sanitary system but instead, drains into one of numerous types of receptors that are connected directly to the sanitary system.

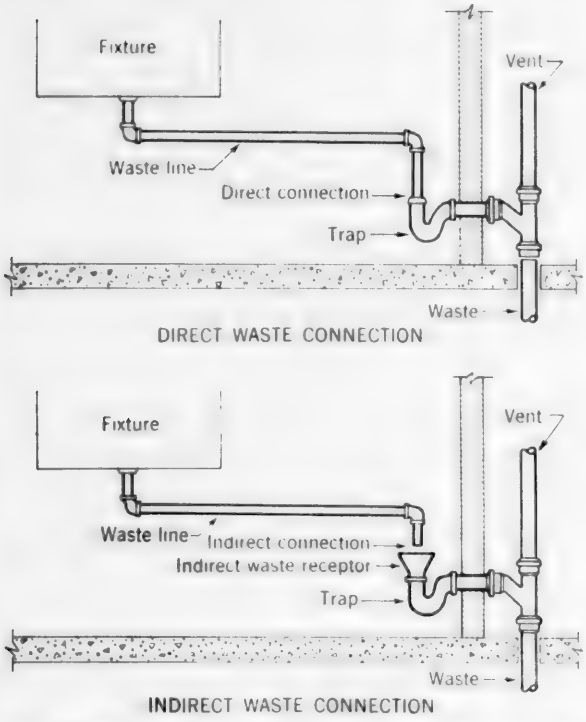


Fig. 1. Examples of direct and indirect waste connections.

In the example of an indirect waste connection, Fig. 1, an indirect waste receptor consisting of a funnel drain is placed in a trap directly connected to the sanitary waste line. The waste line from the fixture terminates above the funnel. With a gap 2 inches or more, depending upon the local code requirements or other authority having jurisdiction.

With a definite gap between the waste pipe and receptor it is impossible for sewer gas to enter the waste pipe from the stack. Furthermore, in the event of a stoppage in the vertical waste stack, the back-up will spill out of the funnel rather than enter the waste line. The waste line from the fixture is known as the indirect waste piping while the funnel is termed the indirect waste receptor. Also shown in Fig. 1 is a waste line from a fixture, directly connected to the sanitary system. Since this is a direct connection, two hazards arise.

1. Sewer gases can pass through the trap when its water seal is insufficient and thus will enter the fixture shown.

2. In the event of a stoppage, waste water can back up in the waste stack and then into the fixture. Both conditions are extremely dangerous, especially when the fixture is one where a high degree of sanitary cleanliness must be maintained.

Indirect Waste Piping

For further clarification on indirect waste piping, Fig. 2, is offered. It shows several types of connections that may be installed on the indirect waste piping to serve various types of fixtures and equipment. In most cases, traps are installed on the connections, as shown. However, in some instances, the traps are not needed. The traps, functioning through a water seal, are primarily intended to prevent pipe odors from entering the room. Connections with and without traps have been included in the illustration to acknowledge the range of application that does exist.

The indirect waste line drains into an indirect waste receptor. The indirect waste receptor is directly connected to the sanitary system and this connection to the sanitary system must always be properly vented. In many cases it must be equipped with a source of water supply. When in doubt about the exact requirements governing your design, consult with the local code authorities.

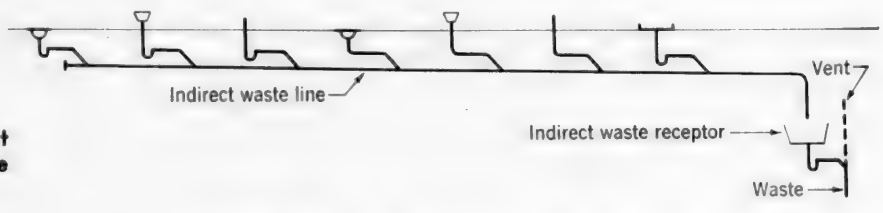


Fig. 2. Diagram of an indirect waste line and an indirect waste receptor.

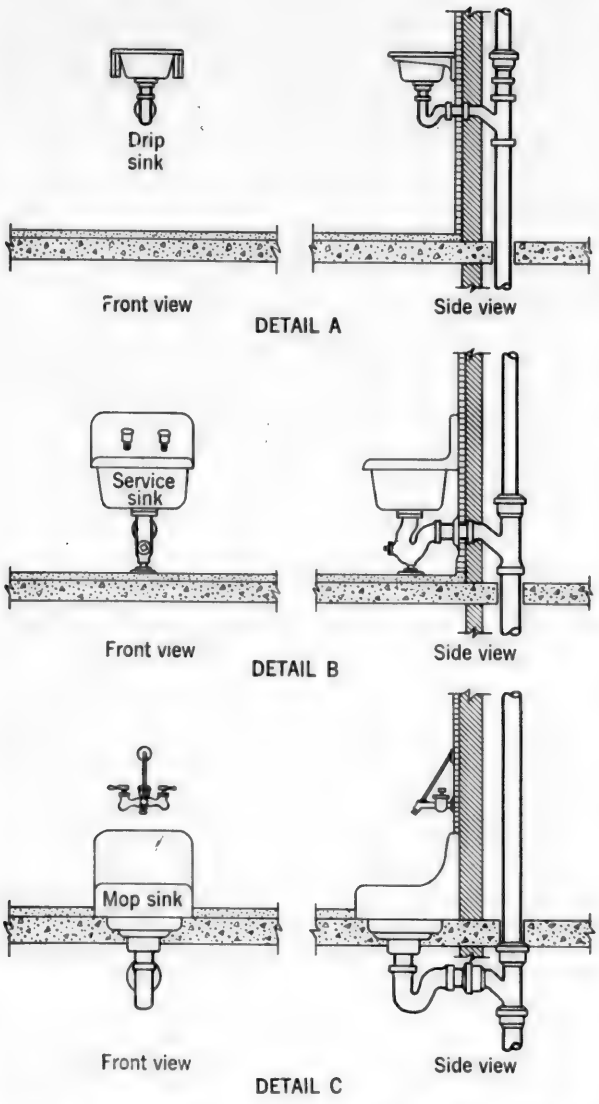


Fig. 3. Three types of fixtures that may be used for indirect waste applications.

Why Indirect Waste Receptors

In general, indirect waste systems are utilized for fixtures, equipment or apparatus where foods will be handled or sterile conditions must be maintained. Therefore, contamination by sewer gas or waste matter must be avoided by an indirect connection. Types of fixtures, equipment and apparatus requiring indirect waste protection will be covered in more detail in the next article.

Fixtures

Many types of fixtures and devices may be used to receive the drainage from indirect waste lines. Several types of fixtures commonly used are shown in Fig. 3.

Detail *A* illustrates an open drip sink which has enjoyed a rather broad application over the period of years. The drip sink may be constructed of galvanized cast iron or steel, copper, stainless steel or other material. Although the drip sink may be placed in several positions, it is shown as being mounted on a wall near the ceiling where an indirect waste line from the floor or floors above would drain into it. Wall brackets are used to support the drip sink. This fixture like all other indirect waste receptors must be properly vented. A water source can be a hose bibb installed over the sink.

At *B* is shown a service sink, a fixture very popular for use as an indirect waste receptor. It must be properly vented in addition to being equipped with a water supply. The service sink may be constructed of galvanized cast iron or steel, vitreous china, stainless steel, copper as well as other materials.

Detail *C* illustrates a mop sink which is also ideally suited for use as an indirect waste receptor. The mop sink is installed in the floor slab and must be properly vented and equipped with a source of water. The mop sink is constructed of galvanized cast iron or enameled cast iron.

Floor Type Indirect Waste Receptors

Many types of floor receptors are available for receiving the waste or drippings from indirect waste lines. Several of these are shown in Fig. 4.

The funnel type receptor is either caulked into the hub of the underground drainage line or is threaded into an adapter which is caulked into the hub. The funnel itself may be of cast iron, bronze or other favored materials.

The air gap is a manufactured specialty that consists of a one piece unit to which the indirect waste line is connected. The slots in the upper portion of the device provide the proper air gap needed for indirect waste purposes. This fitting is available in a number of different sizes and in this instance, the unit shown is caulked into the hub of the underground drainage line.

The ordinary floor drain has always been regarded as an indirect waste receptor. The only disadvantage of using a floor drain to receive the waste or drippings from an indirect waste line is that splashing will occur and cause slippery conditions in the vicinity of the drain. Nevertheless, the floor drain is a good general purpose receptor.

The combination floor drain and funnel possesses the general purpose advantages of a floor drain, and the

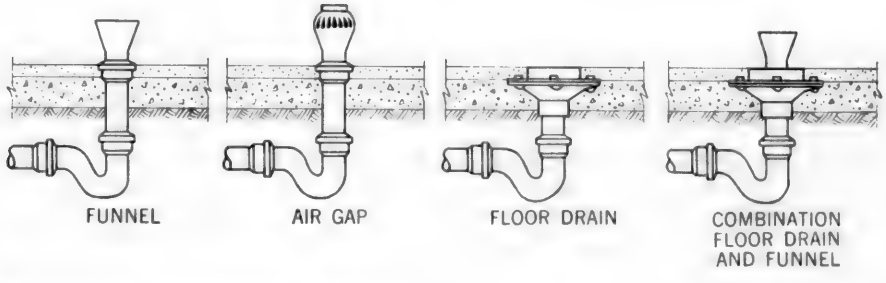


Fig. 4. Several types of indirect waste arrangements.

funnel avoids splashing as it receives the flow from the indirect waste line.

In all the illustrations in Fig. 4, traps are indicated, but the vent connections are not shown. The vent connections must be installed in accordance with provisions of the local code.

Above Floor Indirect Waste Receptors

Many types of receptors are available that may be installed above the floor to handle the waste and drippings from indirect waste lines. A few of these units are shown in Fig. 5.

The open trap consists of a cast iron P-trap connected to a vertical waste line and properly vented. The waste or drip line terminates above the opening in the trap and thereby prevents contamination of the indirect waste line by sewer gas or back-up.

The funnel screwed into the P-trap is a more effective means since it has a broader opening at its mouth to receive the drippings and flow from the indirect waste line. Again, the indirect waste line will terminate above the funnel to afford a sufficient air gap. This connection must be properly vented.

The air gap fitting used in this example is of the threaded type. The indirect waste line is connected to this fitting as shown. Slots in the upper portion of the fitting provide the specific air gap needed to make this connection an indirect waste receptor.

A sink receptor is ideal when a number of waste or drip lines must discharge into one receptor. The width of this receptor makes this flexibility possible. The sink receptor may be constructed of galvanized cast iron, bronze, copper, stainless steel or other types of materials.

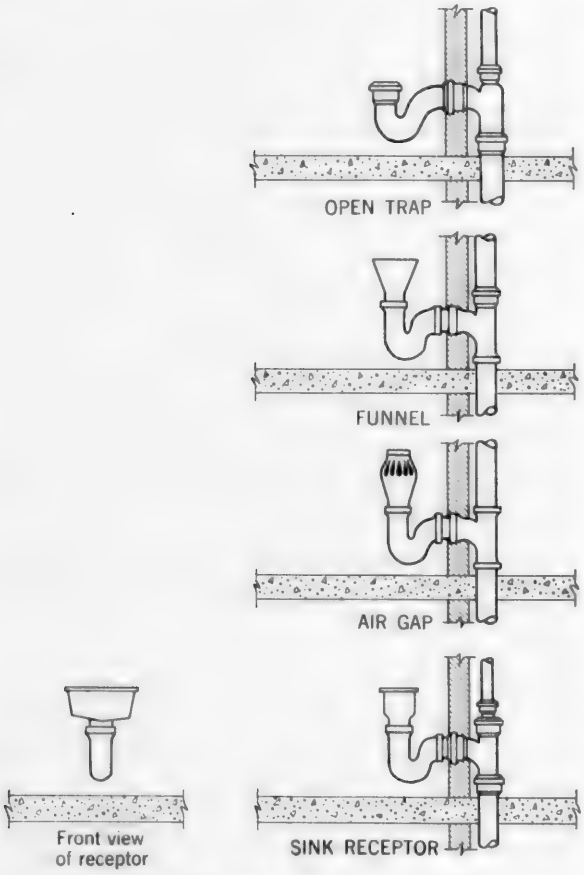


Fig. 5. Types of indirect waste receptors.

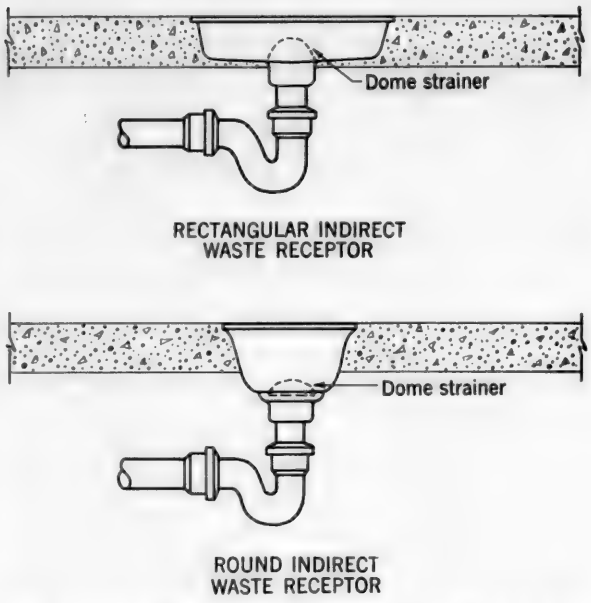


Fig. 6. Two types of waste receptors for use in a floor slab.

Both caulked and threaded connections are shown in Fig. 5 to indicate that the different units shown may be installed either way. Moreover, all the receptors illustrated may be used with waste systems constructed of cast iron, galvanized steel or galvanized wrought iron, or copper tubing.

Floor Sinks

On a number of occasions, floor sinks serve a very practical application in certain areas of the buildings. Figure 6 shows two types of floor sinks.

One type is the rectangular indirect waste receptor. This unit is ideal for kitchen or process applications. It consists of a galvanized cast iron receptor, installed in the floor, and connected to a trap which must be properly vented in accordance with the requirements of the local code. Several sizes of this rectangular type of receptor are available.

The round, indirect waste receptor is also installed in the floor slab and is ideal for kitchen and other specialized applications. This unit, too, is constructed of galvanized cast iron. More frequently however, it is furnished with an enameled inside to present a neat and sanitary appearance. This receptor, as well as the rectangular one, is equipped with a slotted strainer to intercept large pieces of debris that might cause a line stoppage. The round receptor can be furnished with a tapped boss on its side to which a water line may be connected. A water line is then extended over to a flush valve or valve through which water may be dispensed to the unit. A vacuum breaker must be installed between the valve and the unit. When the water is dispensed, it will create a swirling motion in the drain to keep the unit fresh and clean.

Miscellaneous Receptors

There are other types of receptors, all of which have a definite purpose for varied applications. Several of these varied receptors are shown in Fig. 7.

The refrigerator drain is construted somewhat like an ordinary drain with the exception that it has raised sides

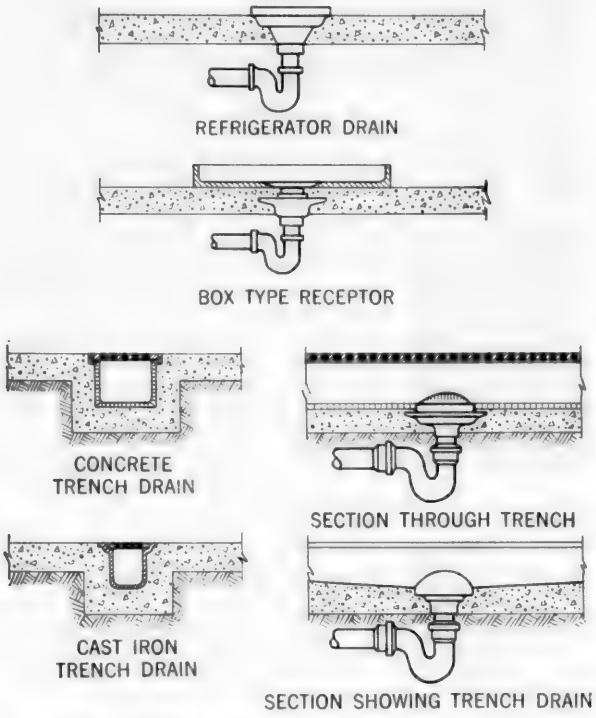


Fig. 7. Several types of indirect waste receptors.

to prevent splashing. This drain, intended for placement under a refrigerator to receive the drippings, is available in painted or galvanized cast iron or bronze. It is connected to a trap and the connection must be vented in accordance with local code requirements.

The box type receptor is a general purpose receptor, generally constructed on a job site during the construction stages. It is utilized with temporary water and waste facilities and its raised sides curb splashing. The box is usually constructed of wood and lined with copper or lead. A floor drain provides the final connection to the trap which of course must be properly vented unless the waste lines drains into another receptor at the base of the stack.

Concrete trenches are often used for indirect waste receptors in mechanical equipment rooms, laundries, industrial spaces and processing areas. The trench is formed in the concrete and is lined with a waterproof material. The continuous grating rests on angle iron framing set in the concrete. A drain is placed at intervals along the trench and must be properly vented as required by the local code. The drain is equipped with a dome strainer to intercept debris that might be washed into the drain. The grating must be strong enough to withstand its surface loads.

Another drain is the manufactured type which comes in sections and is secured together. The sections are usually 30 inches long and are pitched to offer a drainage slope. This trench drain receptor can be furnished with grating that will withstand any surface loads to which the unit is subjected. Deep sections in this trench drain are equipped with an outlet which is connected to a trap as shown and then properly vented in accord with local code requirements.

Trench type receptors may be had in different widths and offer the ideal solution in drainage for the equipment spaces for which they are best suited.

Inverted Top Funnel

Another type of a funnel receptor that is quite popular is the inverted top funnel. This unit was originally designed for marine applications but has since been widely used in commercial applications. Details of this receptor are shown in Fig. 8.

Summary

The top illustration shows the details of this funnel while lower details show applications of the unit installed

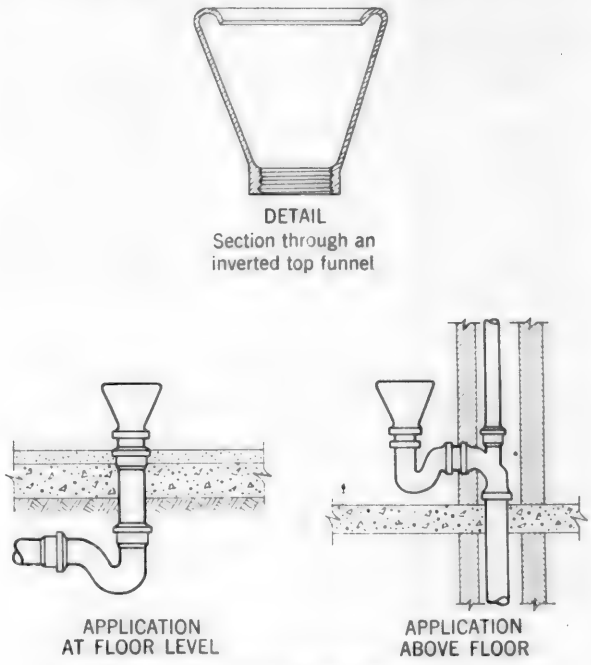


Fig. 8. How the inverted top funnel can be used.

at floor level and above the floor. The funnel design prohibits the waste water from spilling or splashing out of it. This specific funnel is generally constructed of bronze although it may also be made of copper or stainless steel.

The Next Article to Come

The current article discusses the various types of indirect waste receptors. The next article will be a follow up of the subject and it will show by illustrations and text, how some of these receptors are used, and for what applications they may serve.

NEW LITERATURE

Use the prepaid postcard on last page for securing your copies of these catalogs.

Heating Coils

A 32-page bulletin describing the construction and operation of Kennard/Nelson heating coils is offered by American Air Filter Co., Inc., Louisville, Ky. Bulletin contains engineering data for standard steam, hot water, steam distributing and double distributing coils.

Circle **Item 1** on Inquiry Card

Plastic Pipe for Sprinkler Systems

The application of its Type SRK plastic pipe to sprinkler systems is the subject of a 4-page bulletin published by Republic Steel, Cleveland, Ohio. A complete golf course installation is included, as well as brief descriptions of residential and industrial systems.

Circle **Item 2** on Inquiry Card

Packaged Automatic Boilers

Orr & Sembower, Inc., Reading, Pa., offers a 4-page bulletin, No. 1243, describing Power-Pak packaged automatic boilers in the 15 to 25 hp range. Designed for low-pressure steam or hot water heating, these units include integral oil, gas or combination firing equipment.

Circle **Item 3** on Inquiry Card

Remote Room Conditioners

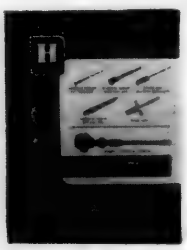
A 4-page bulletin, Catalog No. 381A, describes remote room conditioners produced by Acme Industries, Inc., Jackson, Mich. Data cover vertical units with cabinets, horizontal units with cabinets, vertical units without cabinets, and horizontal units without cabinets, in four sizes.

Circle **Item 4** on Inquiry Card

Recorder Selection

Bulletin GEA-6933, from General Electric Co., Schenectady, N. Y., contains complete specifications for proper selection of the company's recorders. The 12-page bulletin provides information on a complete line of recording instruments, including dimensions, chart speeds, and applications.

Circle **Item 5** on Inquiry Card



Thermocouple Wells and Assemblies

Catalog No. G102-1 from Minneapolis-Honeywell Regulator Co., Philadelphia, Pa., provides all the information necessary to select the proper thermocouple well for any application. It includes well designs and dimensions, pressure and temperature ratings, and thermocouple assembly data.

Circle **Item 6** on Inquiry Card

Valve Comparisons, Specifications

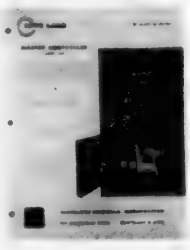
In addition to cross indexing the complete OIC line with the valves of 16 major manufacturers, the Buyers Guide, published by The Ohio Injector Co., Wadsworth, Ohio, contains frequently used abbreviations, a valve trim chart, and a list of valves conforming to Federal specifications.

Circle **Item 7** on Inquiry Card

Control of Draft

A draft control specifications guide, covering commercial and industrial heating system applications, is available from Field Control Div., H. D. Conkey & Co., Mendota, Ill. The 12-page study contains complete sizing tables, application data, dimensional data, and a sample specification.

Circle **Item 8** on Inquiry Card



Master Controller

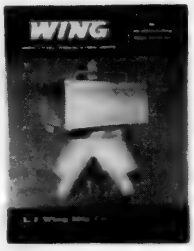
Catalog CMC-687, published by Cleveland Controls, Inc., Cleveland, Ohio, contains descriptive and application data for company's master controller—an instrument that accurately controls pressure or temperature by precise proportioning of process or combustion rate to load demand.

Circle **Item 9** on Inquiry Card

Gas Sampling Systems

Because no single gas sampling system can handle all gas analysis applications, The Hays Corp., Michigan City, Ind., has developed the "package" method of sampling system selection. Complete information on Hays Series 651 gas sampling systems is available in Bulletin 59-B651.

Circle **Item 10** on Inquiry Card



High Level Circulating Units

High-level circulating units for redistributing warm air from ceilings to floor areas are described in a 4-page bulletin available from L. J. Wing Mfg. Co., Linden, N. J. Bulletin HLC-59 includes dimensions, capacities, and area coverage for various mounting heights.

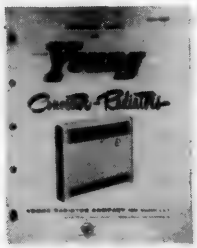
Circle **Item 11** on Inquiry Card

Hermetic Absorption Unit

An 8-page catalog on its hermetic absorption unit, called the Cold Generator, is announced by The Trane Co., La Crosse, Wis. The catalog describes product features, absorption operational cycle, hermetic pump operation, and purge design, and gives dimensions and specifications.

Circle **Item 12** on Inquiry Card

Use the prepaid postcard on last page for securing your copies of these catalogs.



Convector Radiators

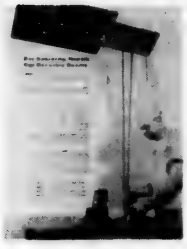
Sixteen-page Catalog 2328 gives complete specification data and capacity information on fifteen models of the enlarged and improved line of convector radiators manufactured by Young Radiator Co., Racine, Wis., and rated in conformance with Commercial Standard CS 140-47.

Circle **Item 13** on Inquiry Card

Smoke Detecting Equipment

A 4-page bulletin, published by Walter Kidde & Co., Inc., Belleville, N. J., describes the company's smoke detecting equipment for ventilating systems to meet certain recent municipal ordinances. Included are principle of operation, installation diagram, and maintenance hints.

Circle **Item 14** on Inquiry Card



Hose Reel Ceiling Outlets

Hose reel ceiling outlets for operating and recovery rooms are described in a 4-page bulletin available from National Cylinder Gas Div., Chemetron Corp., Chicago, Ill. Photographs and diagrams show the installation and operation of the new single and multiple outlets.

Circle **Item 15** on Inquiry Card

Plastic Tapes

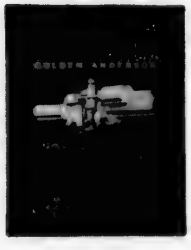
Minnesota Mining and Manufacturing Co., St. Paul, Minn., offers booklet P-PTPF which describes 5 types of plastic "Scotch" brand tapes and methods of applying them for lane marking, color coding, pipe and duct sealing and joining, heat and caustic protection, and masking.

Circle **Item 16** on Inquiry Card

Rigid PVC Products

Rigid PVC products manufactured by Kaykor Industries Inc., div. of Kaye-Tex Mfg. Corp., Yardville, N. J., include plate, joining accessories, extrusions, bolts and nuts, and calendered sheeting. These products, plus fabrication and design tips, are described in Catalog RV-59.

Circle **Item 17** on Inquiry Card



Sewage Surge Relief Valve

Bulletin SEW-1, published by Golden-Anderson Valve Specialty Co., Pittsburgh, Pa., describes a new sewage surge relief valve. Designed to prevent damage from overpressure in sewage lines, the valve opens immediately whenever line pressure exceeds a predetermined setting.

Circle **Item 18** on Inquiry Card

Welding Equipment

All arc welding machines manufactured by Hobart Brothers Co., Troy, Ohio, are described and illustrated in a 24-page catalog, EW-209. In addition, the catalog describes a line of induction heating equipment, pipe thawing equipment, and a power source for cutting and gouging.

Circle **Item 19** on Inquiry Card

Spray Type Deaerating Heaters

A revised bulletin on spray type deaerating heaters is available from Graver Water Conditioning Co., New York, N. Y. Bulletin WC-101C discusses the process and equipment, including principles of deaeration, deaerator operation, design features and accessory equipment.

Circle **Item 20** on Inquiry Card

Flame Failure Safeguards

Bulletin 523, published by Photomation, Inc., Bergenfield, N. J., highlights the safety factor of the company's flame failure safeguard unit in eliminating explosions, and points up its flexibility in application to oil, coal or gas installations. Operation is covered in detail.

Circle **Item 21** on Inquiry Card

Immersion Heating Boilers

Bulletin 5209-B, from Sellers Engineering Co., Chicago, Ill., illustrates and describes the company's low pressure models of immersion steam boilers. These models, for commercial and industrial space heating, range from 80 to 500 hp. Bulletin includes boilers' specifications, output ratings.

Circle **Item 22** on Inquiry Card

Laboratory Service Fixtures

T & S Brass and Bronze Works, Inc., Westbury, L. I., N. Y., manufacturer of the Lab-Flo line of laboratory service fixtures, announces its new product catalog. Representative fixtures, including turrets, hose cocks, stops, remote control assemblies, and specialized service faucets, are described.

Circle **Item 23** on Inquiry Card

Utility Pumps

Continental Pump Co., St. Louis, Mo., announces an 8-page catalog covering its utility pumps which incorporate the helical screw principle. Pumps are furnished separately, close coupled or mounted complete with electric motor or gasoline engine drives in capacities to 50 gpm.

Circle **Item 24** on Inquiry Card

Use the prepaid postcard on last page for securing your copies of these catalogs.

Gas Fired Unit Heater

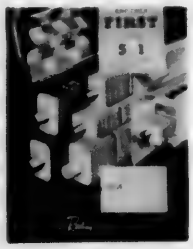
A gas fired unit heater, for application with or without ductwork, is the subject of 4-page Catalog 1526, published by Sturtevant Div., Westinghouse Electric Corp., Boston, Mass. Describing the centrifugal blower type unit are construction features, performance data, and dimensions.

Circle **Item 25** on Inquiry Card

Industrial Vent Pipe

A 28-page bulletin, DS Series 336, describes industrial venting applications of Transite pipe manufactured by Johns-Manville, New York, N. Y. Typical layouts are illustrated, including duct systems, vents and stacks. Available couplings, fittings and accessories are listed.

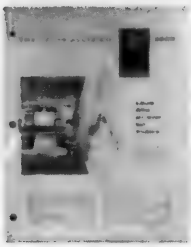
Circle **Item 26** on Inquiry Card



Baseboard Radiation

A 4-page illustrated bulletin is offered by The Rittling Corp., Buffalo, N. Y., describing its new line of 5 in 1 baseboard radiation. Bulletin No. R-596 gives complete dimensions and capacity data for five different heating elements which fit one size enclosure.

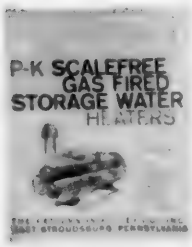
Circle **Item 27** on Inquiry Card



Fan Motors

The Louis Allis Co., Milwaukee, Wis., announces a 4-page bulletin, No. 2950, on its line of Air-Over fan motors. Illustrated bulletin gives application data for determining the motor horsepower rating required in an installation for various air velocities across the motor.

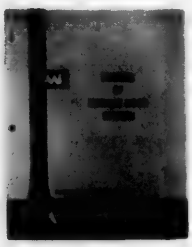
Circle **Item 28** on Inquiry Card



Indirect Gas-Fired Storage Heater

To introduce the Scalefree indirect gas-fired storage water heater, 20-page Bulletin No. 4 illustrates and describes design, operation, construction features and installation specifications of the packaged unit manufactured by The Patterson-Kelley Co., Inc., East Stroudsburg, Pa.

Circle **Item 29** on Inquiry Card



Foundry Exhaust Hoods

A 28-page manual of exhaust hood designs for the foundry industry is available from American Air Filter Co., Inc., Louisville, Ky. Bulletin 270-E2A, Volume 2, has been prepared to illustrate various exhaust hood designs for the many different operations common to a foundry.

Circle **Item 30** on Inquiry Card

Underground Irrigation Pipe

Economical, dependable irrigation is made easy with K&M asbestos-cement underground irrigation pipe, according to an 8-page brochure, AP-25, issued by Keasbey & Mattison Co., Ambler, Pa. Tips on installation in a variety of applications and complete specifications are included.

Circle **Item 31** on Inquiry Card

Air Conditioning Equipment

A product catalog of commercial and industrial air conditioning and refrigeration equipment is available from Larkin Coils, Inc., Atlanta, Ga. Products include coils, cooling towers, evaporative and air cooled condensers. Engineering sections contain selection and application data.

Circle **Item 32** on Inquiry Card

Roof Ventilators

A roof ventilator which conforms to modern architectural styles is introduced by Bowman Steel Corp., Pittsburgh, Pa. It features a low silhouette combined with low internal resistance, low cost, and low maintenance. Complete specifications are given in Bulletin V-1759.

Circle **Item 33** on Inquiry Card

Gaskets and Shims

A 4-page gasket and shim guide is published by Akron Metallic Gasket Co., Akron, Ohio. This informative guide is divided into 5 sections—Gaskets, Shims, Washers, Installation Accessories, and New Filler Material—with cross-sectional views and explanation of construction.

Circle **Item 34** on Inquiry Card

Plastic Tube Protectors

Full details on condenser and heat exchanger tube protectors that extend the useable life of old tubes and greatly increase the life of new tubes are given in Bulletin No. P-335 by Crane Packing Co., Morton Grove, Ill. Protectors are available in three plastics.

Circle **Item 35** on Inquiry Card

Boiler Water Conditioning

A 6-page technical brochure describing the Filtrion automatic side-stream boiler water control system for steam boilers is available from Sparkler-Filtrion Corp., North Chicago, Ill. Brochure discusses how system keeps boiler water clear by eliminating sludge, suspended solids.

Circle **Item 36** on Inquiry Card

PRODUCT APPLICATIONS

New, Unusual, or Ingenious Uses of Equipment and Materials

Chilled Air Influx Problem Solved by Door Heaters

A familiar industrial problem, the influx of chilled air through open shipping doors, has been solved at American Furniture Co., in Martinsville, Va., by installation of high-velocity door heaters.

The company's Plant 2 and Plant 5 face each other across a street, with heavy traffic between them. This means that the shipping doors in each plant must be

opened frequently even in cold weather. The resulting cold air flow increased heating costs, threatened exposed raw materials, and adversely affected the efficiency of employees working near the doors. The problem was aggravated by dust collection system exhaust which creates a negative pressure inside each building. This slight vacuum adds to the velocity and volume of air admitted when shipping doors are open.

After a study of several possible solutions, the company installed high-velocity door heaters made by the L. J. Wing Mfg. Co., Linden, N. J. A heater was installed above and just in front of each 8x8-ft door, with its discharge 8½ ft above the floor. A fan, blowing air down over steam-heated coils, enables each heater to produce a curtain of warm air downward to the floor. This tempers the incoming air, keeps raw materials safe, and keeps working areas near the doors at comfortable temperatures.

Adhesives Offer Many Advantages For Attaching Insulation

Heating and air conditioning contractors can do a better job and at the same time realize savings by using adhesives to bond insulating materials to equipment such as duct work, pipes, furnaces and boiler jackets, blower housings and plenum chambers.

Adhesives increase insulation efficiency because they give continuous contact between the insulating material and base surface. Adhesives distribute the load evenly over the entire joined area and minimize local stress concentration points. With adhesive bonded insulation, metal surfaces and insulation need not be pierced, cut or marred. Thus, not only is matting or crushing of the insulation prevented, but additional heat transfer through holes and mechanical fasteners required for other fastening methods is also eliminated. Adhesives are easy to use and can be applied quickly with a brush, spray or roller.

Several types of adhesives have been developed by Adhesives, Coatings and Sealers Div., Minnesota Mining and Manufacturing Co., St. Paul, Minn., for bonding a wide variety of insulation materials to bare, painted or enameled metal.

Adhesives for bonding insulation materials range from the long open time, slow-drying types to rapid-drying, good immediate strength types, and from water dispersed and fire-retardant adhesives to types that offer high heat resistance for bonding insulation to high temperature surfaces.

Concrete Saw Speeds Installation Work At Albuquerque Swimming Pool

Concrete saws and blades are playing an important role in the installation work at the Rio Grande Swimming Pool, in Albuquerque, N. Mex.

New drains are being installed in the existing structure which has necessitated removal of concrete and tile to allow new pipes to be laid. This work is being done by

Byer Plumbing and Heating Co., who reports good results from the use of the self-propelled concrete saw and blades manufactured by Eveready BrikSaw Co., Kansas City, Mo.

Sawing with these products confines the area from which the material is removed to the exact dimensions needed, reduces the amount of replacement material, and results in an over-all neater job, the contractor reports.

Semi-Rigid Insulation Prevents Heat Transfer Between Warm and Fresh Air Supplies

Twenty-one thousand square feet of semi-rigid, spun mineral wool duct insulation 1-inch thick is preventing heat transfer between the warm and fresh air supplies of an unusual heating system at the new Minerva Deland High School, at Fairport, N. Y.

An interesting feature of the school's heating installation is that the warm air supply ducts run through large underground tunnels, as shown in photo, which themselves carry the fresh air supply. At each classroom, or

other heating zone, the warm and the fresh air are mixed in proportions controlled by thermostat setting, and this mixture is delivered through 14-inch diameter conduits to tempered air registers located under the windows in each room.

The main warm air supply is delivered by a 45,000 cfm fan through ducts 7 ft wide by 4 ft high. Heated air for the auditorium, gymnasium, swimming pool and a second-floor classroom area are supplied separately by smaller fan units. At each fan location the air is warmed by coils carrying 220 deg water from a central hot water supply. The semi-rigid insulation prevents loss of heat from the warm air to the fresh air, thus insuring a correct mixture of warm and fresh air at the thermostatically controlled dampers.

Lightweight and non-irritating to handle, the insulation, manufactured by Baldwin-Ehret-Hill Co., Trenton, N. J., was applied in flat sheets with its factory-applied vapor barrier on the outside. The school was designed by Ben Ade, Rochester, architect; and the heating system by Albert Hartsig of Peck Associates, Fairport. William Schmitt, Inc., Rochester, installed the heating system and E. J. Eddy, Inc., Rochester, a subsidiary of Mundet Cork Corp., the insulation.

Monday Morning Troubles in Air Equipment Ended with Purifiers and Drainers

An Alabama stamping plant experienced plant equipment shutdowns due to water forming in air lines, particularly following week-end shutdowns when outside air temperature was low. Although the air system was equipped with an aftercooler as well as a purifier, water vapors condensed out in the lines beyond the aftercooler due to low surrounding temperatures. This would cause the moisture to foul the automatically-operated air control equipment.

To remove the moisture, low-cost purifiers and drainers, manufactured by The V. D. Anderson Co., Cleveland, Ohio, individually and accurately sized for each application were installed immediately ahead of the air-powered stamping presses and other air-controlled equipment. After 15 months of service, the stamping company reports no shutdowns due to moisture fouling equipment.

Anderson engineers point out that although intercoolers and aftercoolers, as well as purifiers, are used in an air system, it is always advisable to install small or line purifiers at the point of usage to remove condensate which condenses out in the air lines after leaving the aftercooler.

Master Panel Pictures Systems For Office Building Control

Trouble in air conditioning or heating systems at an Eastman Kodak office building can be pinpointed easily now, thanks to a new photographic control feature. It consists of a ground glass projection screen built into the center of a master control panel. The panel regulates air conditioning, heating, and water temperature for an entire newly-remodeled office building.

Whenever an operator activates one of a number of large fans or pumps at remote locations, a color photo-diagram of the particular system is projected automatically on the screen. This immediate reference is an important aid in locating trouble or malfunction. In photo, an air conditioning system appears on projection screen at upper left.

Elmer Andrews, manager of building service at Kodak Office, said the master panel controls temperatures of six different kinds of water for drinking, washing, and photographic operations. The panel also shows at a glance the status of cafeteria refrigeration and of cold storage rooms for film.

Besides the eye of photography, the panel provides a double-check by ear. An operator can switch on a microphone in each of the fan rooms and listen to learn if the machines are operating smoothly.

DEGREE-DAYS FOR OCTOBER, 1959

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

AIR CONDITIONING, HEATING AND VENTILATING'S 32nd Year of Publication of Monthly Degree-Day Data

City	October			Season to Oct. 31, incl., from Sept. 1		
	1959	1958	Normal	1959	1958	Normal
Abilene, Texas (A)	118	133	98	126	139	153
Albany, New York (A)	423	499	443	566	641	582
Albuquerque, New Mexico (A)	250	249	218	270	284	228
Alpena, Michigan (C)	613	462	530	841	663	745
Anchorage, Alaska (A)	998	1094	899	1512	1646	1409
Asheville, North Carolina (C)	204	292	262	225	333	312
Atlanta, Georgia (A)	121	115	110	129	115	118
Atlantic City, New Jersey (C)	215	301*	230	254	363*	259
Augusta, Georgia (A)	74	134	282	75	135	59
Baltimore, Maryland (C)	191	226	207	219	247	236
Billings, Montana (A)	543	404	497	794	566	691
Binghamton, New York (C)	318	460	428	409	615	569
Birmingham, Alabama (A)	99	107	123	100	107	136
Bismarck, North Dakota (A)	749	535	598	1022	720	825
Block Island, Rhode Island (A)	282	369	330	355	455	418
Boise, Idaho (A)	470	299	389	683	442	524
Boston, Massachusetts (A)	319	386	315	398	470	392
Buffalo, New York (A)	388	395	433	499	520	555
Burlington, Iowa (A)	424	288	336	506	370	419
Burlington, Vermont (A)	525	543	521	702	734	693
Cairo, Illinois (C)	196	156	161	198	174	189
Charleston, South Carolina (C)	28	66	34	28	66	34
Charlotte, North Carolina (A)	148	178	147	150	180	154
Chattanooga, Tennessee (A)	149	174	169	150	182	193
Cheyenne, Wyoming (A)	675	467	577	973	670	818
Chicago, Illinois (A)	406	255	350	468	322	440
Cincinnati, Ohio (C)	242	214	222	271	236	264
Cleveland, Ohio (A)	348	316	340	426	402	340
Columbia, Missouri (A)	319	224	262	364	272	324
Columbia, South Carolina (A)	98	148	76	99	151	76
Columbus, Ohio (C)	313	307	299	367	361	358
Concord, New Hampshire (A)	485	544	527	659	726	719
Concordia, Kansas (C)	382	236	277	467	286	332
Dallas, Texas (A)	73	78	53	73	78	53
Denver, Colorado (A)	518	342	425	709	448	545
Des Moines, Iowa (A)	471	304	355	602	381	454
Detroit, Michigan (A)	408	323	381	500	421	477
Devils Lake, North Dakota (C)	879	580	654	1210	838	930
Dodge City, Kansas (A)	364	240	262	420	288	302
Dubuque, Iowa (A)	569	349	444	717	479	593
Duluth, Minnesota (A)	790	603**	614**	1101	882**	891**
Elkins, West Virginia (A)	(a)	432	412	(a)	577	534
El Paso, Texas (A)	33	120	70	33	136	70
Ely, Nevada (A)	580	533	561	922	760	789
Escanaba, Michigan (C)	620	471	555	820	701	802
Evansville, Indiana (A)	272	256	215	294	295	274
Fairbanks, Alaska (A)	1262	1555	1163	1904	2215	1775
Fargo, North Dakota (A)	746	494	586	972	668	801
Fort Smith, Arkansas (A)	137	140	131	137	154	140
Fort Wayne, Indiana (A)	412	343	377	495	449	484
Fort Worth, Texas (A)	68	82	58	68	82	58
Fresno, California (A)	54	21	86	60	23	86
Galveston, Texas (C)	10	35	0	10	35	0
Grand Junction, Colorado (A)	386	278	333	524	340	369
Grand Rapids, Michigan (A)	492	374	462	601	525	606
Green Bay, Wisconsin (A)	642	437	515	829	631	698
Greensboro, North Carolina (A)	222	253	202	248	274	231
Greenville, South Carolina (A)	167	160	131	170	166	141
Harrisburg, Pennsylvania (A)	280	336	308	339	398	377
Hartford, Connecticut (A)	366	460	384	473	596	485
Havre, Montana (C)	677	512	564	987	738	834
Helena, Montana (A)	652	561	617	1003	824	937
Houston, Texas (C)	10	52	0	10	52	0
Huron, South Dakota (A)	656	426	472	844	543	621
Indianapolis, Indiana (A)	371	318	306	425	395	385
Jackson, Mississippi (A)	71	83	69	71	83	69
Juneau, Alaska (A)	757	736	716	1165	1257	1196
Kansas City, Missouri (A)	289	176	240	333	201	284
Knoxville, Tennessee (A)	157	169	179	157	174	212
La Crosse, Wisconsin (A)	577	350	447	733	467	599
Lander, Wyoming (A)	647	472	632	944	665	876
Lewiston, Maine (O)	519	594	501	690	779	666

a) Data not available.
* Figures based on Airport readings.
** Figures based on City office readings.

Normal figures in this table are based on 30-year period covering 1921 to 1950, inclusive, as compiled and published by the U. S. Weather Bureau.

Figures in this table, with two exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Co., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively. [Table concluded on page 96]

Degree-Days for October, 1959 (Concluded)

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

AIR CONDITIONING, HEATING AND VENTILATING's 32nd Year of Publication of Monthly Degree-Day Data

City	October			Season to Oct. 31, incl., from Sept. 1		
	1959	1958	Normal	1959	1958	Normal
Lincoln, Nebraska (C)	414	249	310	523	295	389
Little Rock, Arkansas (A)	106	115	110	106	125	120
Los Angeles, California (C)	2	2	41	2	2	58
Louisville, Kentucky (A)	241	229	232	252	252	283
Lynchburg, Virginia (A)	250	264	236	287	298	285
Macon, Georgia (A)	75	78	63	79	78	63
Madison, Wisconsin (A)	566	371	419	703	508	556
Marquette, Michigan (C)	670	477	543	874	685	779
Memphis, Tennessee (A)	111	138	126	111	150	143
Meridian, Mississippi (A)	81	82	90	81	82	90
Milwaukee, Wisconsin (A)	529	348	428	646	481	562
Minneapolis, Minnesota (A)	634	370	459	786	478	616
Moline, Illinois (A)	462	289	363	562	382	459
Montgomery, Alabama (A)	61	59	69	61	59	69
Nashville, Tennessee (A)	170	187	154	170	203	176
New Haven, Connecticut (A)	315	396	363	384	494	456
New Orleans, Louisiana (C)	13	29	5	13	29	5
New York, New York (C)	244	296	263	284	335	302
Newark, New Jersey (A)	233	323	301	272	360	348
Norfolk, Virginia (A)	133	132	152	143	139	161
North Platte, Nebraska (A)	594	416	425	792	526	545
Oak Ridge, Tennessee (C)	153	194	225	153	216	225
Oakland, California (A)	62	81	157	87	97	233
Oklahoma City, Oklahoma (A)	206	158	149	230	175	161
Omaha, Nebraska (A)	(a)	272	331	(a)	324	419
Parkersburg, West Virginia (C)	275	305	272	319	360	328
Peoria, Illinois (A)	419	274	339	485	346	425
Philadelphia, Pennsylvania (C)	207	278	219	235	311	252
Phoenix, Arizona (A)	26	4	13	26	4	13
Pittsburgh, Pennsylvania (C)	285	312	298	341	376	354
Pittsfield, Massachusetts (A)	480	570	543	660	792	756
Pocatello, Idaho (A)	(a)	421	487	(a)	595	670
Portland, Maine (A)	522	586	515	703	796	714
Portland, Oregon (C)	234	187	280	348	258	365
Providence, Rhode Island (A)	354	415	381	455	523	488
Pueblo, Colorado (A)	477	312	383	611	373	457
Raleigh, North Carolina (A)	189	217	118	212	240	128
Rapid City, South Dakota (A)	630	412	500	890	539	693
Reading, Pennsylvania (C)	250	313	285	293	370	342
Red Bluff, California (A)	30	26	59	44	29	59
Reno, Nevada (A)	404	377	443	648	532	608
Richmond, Virginia (A)	217	212	210	253	236	243
Rochester, New York (A)	407	428	440	533	568	573
Roswell, New Mexico (A)	191	217	156	205	255	164
Sacramento, California (C)	48	19	75	60	22	92
St. Joseph, Missouri (A)	384	244	233	457	288	282
St. Louis, Missouri (C)	225	170	202	250	198	240
Salt Lake City, Utah (A)	422	300	381	592	416	469
San Antonio, Texas (A)	27	75	25	27	75	25
San Diego, California (A)	11	1	52	11	1	76
Sandusky, Ohio (C)	359	299	327	420	366	393
San Francisco, California (C)	73	112	128	146	151	238
Sault Ste. Marie, Michigan (A)	686	575	298	917	848	937
Savannah, Georgia (A)	30	84	38	30	84	38
Scranton, Pennsylvania (A)	372	463	389	466	620	504
Seattle, Washington (C)	328	265	329	495	370	463
Sheridan, Wyoming (A)	638	491	578	934	701	817
Shreveport, Louisiana (A)	61	85	53	61	85	53
Sioux City, Iowa (A)	516	315	405	658	389	533
Spokane, Washington (A)	581	452	508	892	678	713
Springfield, Illinois (A)	339	276	259	395	335	315
Springfield, Missouri (A)	300	247	249	332	296	310
Syracuse, New York (A)	393	451	396	508	584	513
Toledo, Ohio (A)	470	367	387	568	484	489
Topeka, Kansas (C)	375	244	242	438	293	284
Trenton, New Jersey (C)	254	329	285	302	383	340
Tulsa, Oklahoma (A)	170	146	152	184	164	170
Utica, New York (O)	333	466	430	424	623	612
Valentine, Nebraska (A)	653	449	461	886	579	606
Walla Walla, Washington (C)	321	303	308	447	385	401
Washington, D. C. (C)	213	208	231	246	231	263
Wichita, Kansas (A)	300	205	219	341	240	251
Williston, North Dakota (C)	788	517	605	1100	744	866
Winnemucca, Nevada (A)	469	462	508	745	660	688
Yakima, Washington (A)	446	452	446	653	644	596

For footnotes, see page 95.

NEWS OF EQUIPMENT AND MATERIALS

Use the convenient prepaid postcard appearing on the last page for securing additional information about new equipment and materials described in this department.

Hooded Exhaust Ventilator

Shown with hood open and with hood closed is the Westernaire, a low silhouette hooded exhaust ventilator introduced by Western Engineering and Mfg. Co., Venice, Calif. Unit's housing is very low, yet its 360° near horizontal discharge is said to provide maximum efficiency in commercial or industrial installations.

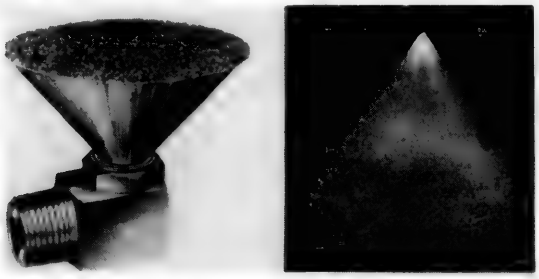
Features include near horizontal discharge to prevent roof damage, motor isolation mounts, integral base and fan inlet, hinged head on larger models, tubular motor bracket on larger models, venturi throat to decrease turbulence, and optional screens and safety disconnect switches.

Motors are mounted below the venturi to insure an unobstructed airstream discharge. Standard construction is of heavy gage steel, but ventilator is also available in aluminum, or non-corrosive Owens-Corning Fiberglas.

More information? Circle Item 37, postcard, last page.

Centrifugal Spray Nozzle

A solid-cone centrifugal type industrial spray nozzle, called Tan-Jet, is an addition to the standard catalog line of Wm. Steinen Mfg. Co., Newark, N. J. Nozzle is available in ¼-, ⅜- and ½-inch sizes with male or female connections. These nozzles offer capacities of from 0.50 to 10 gpm at 40 psi.



Construction of the nozzle is such that there are no moving parts, resulting in long, trouble-free life, the company states. The three-piece design body, removable cap and internal member permits easy cleaning. These nozzles are available in brass, steel, 303 stainless, and in other materials upon request.

The solid-cone spray is said to give uniform distribution and atomization throughout the entire spray pattern with atomization finest a high pressures. It is recommended for applications in industrial washing, cooling, brine spraying, foam control, dust control, and many chemical processes.

More information? Circle Item 38, postcard, last page.

Cast Iron Baseboard Moulding

A heat-proof, extruded Neoprene moulding for cast iron baseboards, called Trim-Seal, is announced by Weil-McLain Co., Michigan City, Ind.

Said to be quickly installed with no nailing by simply slipping the extended skirt of the seal between the baseboard and the wall, the moulding can be painted, will not warp, and is flexible enough to fit snugly despite minor wall irregularities, the company states. The result is said to be a pleasing appearance.

Butt joints cut with a knife or hack saw blade are satisfactory when two seal strips are needed, and 45° joints for corners are easily made with a miter box furnished with each package of seal strips.

More information? Circle Item 39, postcard, last page.

Sonic Filter Cleaning

Sonoclean, a system for cleaning glass filter bags employing generators of low audible frequency, is announced by Fuller Co., Catasauqua, Pa., a subsidiary of General American Transportation Corporation. The glass filter bags are used to catch dust and corrosive fumes from industrial plants.

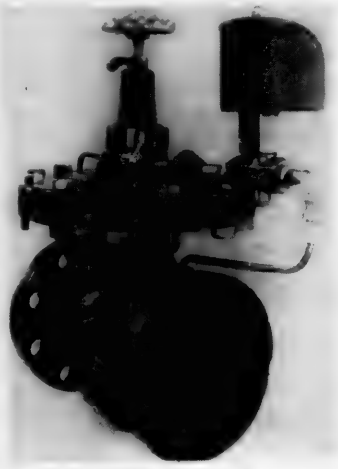
Sound waves clean the bags by making them vibrate in an undulating motion, without flexing. According to the manufacturer, the glass bag filter system with sonic cleaning is more economical than electrostatic methods and effectively cleans dry, hot gases, eliminates extensive shaking mechanisms, and is also successful in handling low temperature gases.

Application of the filtration method to cement kilns, metallurgical furnaces, calciners, and processes involving corrosive chemicals, carbon black production, steam micronizers, and others, is cited.

More information? Circle Item 40, postcard, last page.

Solenoid Actuated Regulators

Solenoid actuated regulators for on-off control are available from OPW-Jordan, Cincinnati, Ohio, for use in industry wherever remote shut-off, remote start up, automatic safety shut-off, and combination pressure and temperature control with an electric signal are needed.



When the solenoid opens, it allows steam to enter the pilot chamber and operate the main valve as a normal pressure regulator. When the solenoid closes, the steam supply to the pilot is shut off and the main valve closes automatically.

Valves are available in ductile iron, ½-3 inches; in bronze, ½-2 inches; and in cast iron, 2½-3 inches, suitable for maximum temperatures of 500 deg F and pressures of 250 psi.

Packless construction, silent operation, freedom from wire drawing, positive tight shut-off, reasonable pricing and elimination of the necessity for separate shut-off gate valve are listed as features of this valve.

More information? Circle Item 41, postcard, last page.

Glass Drainline System

A lightweight Pyrex glass drainline system with one-piece couplings for quick, permanent compression joints is introduced for disposal of chemical wastes by Corning Glass Works, Corning, N. Y.

The drainline has been engineered to cut installation time and cost, and eliminate failure because of corrosion and joint leakage, the company said. Designed for vertical or horizontal mounting, the system can be buried in the ground.

The manufacturer is guaranteeing the line against breakdown because of either corrosion or joint leakage for the lifetime of the building in which it has been installed. System is made up of hard, low-expansion borosilicate glass piping and fittings that are resistant to virtually all corrosives. Only massive quantities of hydrofluoric acid and hot alkalies measurably affect the material, the company said.

Coupling consists of a stainless steel shell, a rubber sleeve, and a line of Teflon 100-X, a Du Pont material said to be as corrosion-resistant as the glass.

With the new coupling, the joint can be made quickly by stabbing both ends of the glass pipe into the coupling and turning a single nut.

A lighter weight pipe is offered for above-ground installation. A 1½-inch dia section of this pipe weighs 0.64 lb per ft. Regular weight glass piping is available for burial in the ground. The line also can be set in concrete, or inside any trough or sleeve.

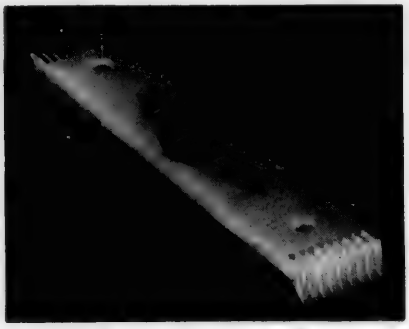
Thirty glass fittings are offered for the drainline system. These fittings and the ends of all straight lengths are tempered for mechanical strength and thermal shock resistance. The ends of each section of piping are beaded. The coupling is designed to accommodate this bead. Corning said that tests have shown this combination contributes to the reliability of the joint.

System will handle working pressures up to 15 psig and temperatures to 250 deg F. Standard pipe lengths are 5 and 10 ft, with diameters ranging from 1½ to 6 inches. A redesigned field fabrication kit has been developed to permit cutting and beading of odd-length sections of all diameters at the job site.

More information? Circle Item 42, postcard, last page.

Nylon Comb Straightens Fins

Watsco Inc., Hialeah, Fla., announces its new all-nylon Fin-Comb for straightening evaporator and condenser fins. It is made to accommodate most units. The tooth



depth and slant is an engineered feature that aids in straightening the most stubborn fins.

Fin-Comb may also be used for cleaning the matted accumulation of lint in the evaporator.

More information? Circle Item 43, postcard, last page.

Poppet-Type Pressure Relief Valve

A new poppet-type pressure relief valve, listed by AGA in compliance with the latest American Standard ASA Z21.22-1958, is introduced by Watts Regulator Co., Lawrence, Mass.

Designated No. 3L, it features an all-bronze (85% copper) body, stainless steel spring, and generous water flowways. It is expected to fill the need for an economical pressure-only relief valve which complies with the latest ASA standard and also meets 1959 requirements.

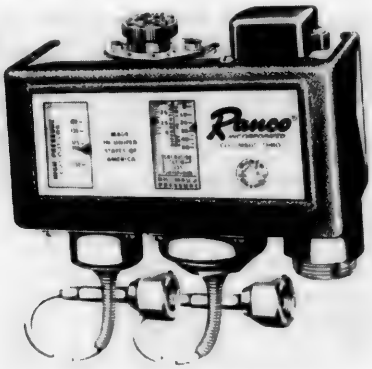
The No. 3L is available in ½ x ½-inch and ¾ x ¾-inch sizes.

More information? Circle Item 44, postcard, last page.

DPST Controls for Commercial Use

Series 5000, 6000, and 7000, double pole, single throw O-type refrigeration and air conditioning controls, offered by Ranco, Inc., Columbus, Ohio, are designed to handle a wide variety of commercial applications.

Controls are available in single unit models for low



pressure, high pressure and temperature; and in dual models for dual pressure or dual temperature.

Units are designed for two pole switching jobs, such as a double break for single-phase operations, simultaneous switching of two circuits, or switching two lines of a three-phase circuit. According to the company, the chief advantage of these units are their wide product application and simplified servicing.

More information? Circle Item 45, postcard, last page.

1960 Conditioner Line

Packaged and split system heat pumps are included among sixteen new models in the 1960 line of residential and commercial heating and air conditioning equipment announced by Airtemp Div., Chrysler Corp., Detroit, Mich.

A 3-hp packaged heat pump has a 35,000-Btu capacity and centrifugal blowers on both evaporator and condenser, permitting ducting of condenser air so that units may be easily installed in hip-roof type homes as well as interior offices. A removable blower section makes handling easier, while its refrigerant control is said to result in better performance of the unit over a wide range of operating conditions. Flexible air intake and discharge arrangements simplify the job of outside installation.

A 5-hp split heat pump is available with 9.6 or 19.2-kw electric heater. Weather hood is insulated with glass fiber. Summer-winter thermostat check light indicates failure of controls. Built for operation down to 0 deg F, the heat pump's condensing unit is of a quality associated with larger-sized models, with permanently lubricated bearings, aluminum compressor and crankcase heater, strainer dryer, heavily-plated fans, automatic reset.

Commercial water-cooled packaged units in the 1960 line, in a 22- to 32-ton range, like the company's 3- through 15-ton models, have positive, year-round humidity control design characteristics and electronic safety devices. They permit front or rear air return, and are designed for the internal mounting of steam or hot water heating coils. They can be used either in space or outside. They are said to have high Btu-output to kw-input ratios.

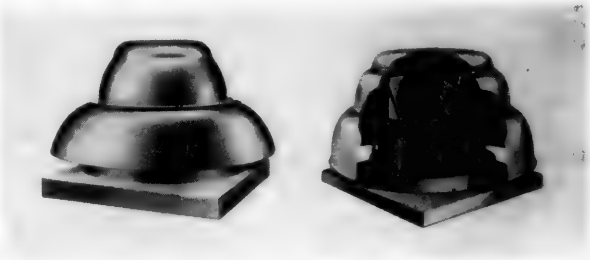
Among the new furnaces are three gas-fired lowboy models in striking color combinations for "prestige" installations in basement recreation rooms or living areas. Only 45 inches high, they form a possible cooling combination that will fit in a 6-ft basement. They also can be equipped with an electrostatic filter, a charcoal filter and a sterile lamp—all within the unit.

Five oil-fired horizontal furnaces are also available, said to provide maximum installation flexibility with baked enamel cabinet, stainless steel combustion chambers, and 10-year warranty on heat exchangers. Permanently-lubricated blower bearings are cushion mounted. They have sufficient air to handle cooling combinations of 2 through 8 hp.

More information? Circle Item 46, postcard, last page.

Low Profile Ventilators

Centriflow fan roof ventilators, a completely new line of low contour centrifugal units, are announced by The Burt Manufacturing Co., Akron, Ohio. The ventilators are designed particularly for exhausting air from schools, churches, hospitals, auditoriums, kitchens, lavatories and in other areas where roof mounting of a low contoured unit is desired.



Twenty-five basic selections of tip speeds and capacities in direct drive models and 64 basic belt drive models, with horsepower ratings from 1/60 to 7½, provide capacities from 65 to 27,648 cfm. All models feature heavy-gage spun aluminum housings, with non-overloading backward curved, non-sparking, aluminum fan wheels. Motors and drives are on oversized resilient mountings and in separate compartments out of the air stream. V-belt drive units have adjustable sheaves to permit changing capacities easily at any time.

More information? Circle Item 47, postcard, last page.

Stainless Steel Sink Wastes

Lever-operated and rotary-operated sink wastes are now offered with stainless steel flanges and handles by Atlantic Brass Works, Inc., Chicago, Ill. These items are offered as standard.

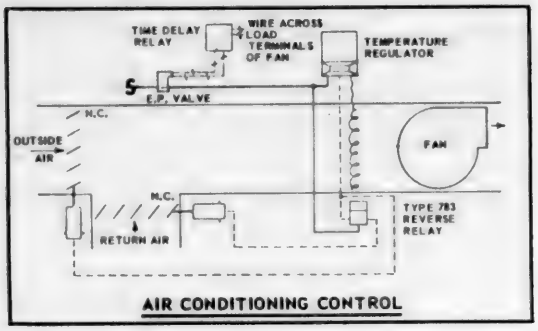
Rounding out its line of lever and rotary wastes, consisting, the company states, of all types and styles custom-made for the standard 3-inch sink opening, is a line of rotary wastes to fit a 3½-inch sink opening.

More information? Circle Item 48, postcard, last page.

Pneumatic Reverse Relay

Type 783 reverse relay, a pneumatically-operated auxiliary device which reverses the action of a pneumatic valve, motor, or damper, is announced by The Powers Regulator Co., Skokie, Ill. It can be used wherever the action of the controller must be reversed.

A recommended application is in combination with normally-closed valves where fail-safe protection must be provided in case of air failure. Its compact size



AIR CONDITIONING CONTROL

(1 9/16-inches dia. by 2⅝-inches long) is 60% smaller than its predecessor model. It can be mounted behind control panels, next to wall-mounted thermostats, or directly on a valve or damper motor.

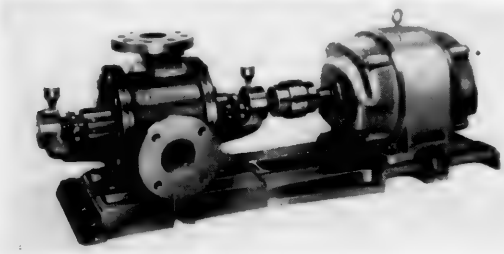
An application to air conditioning is illustrated. The reversing relay permits a normally closed return air damper to be used to provide complete damper shutdown when fan is not operating. This safety feature reduces the possibility of fire travelling in the duct work. The time delay relay, with large fans, will prevent damper damage on shutdown by holding dampers open until fan blade stops moving. Fresh and return air dampers are positioned according to the set point of the temperature regulator.

More information? Circle Item 49, postcard, last page.

Two-Stage Turbine Pumps

Important design changes on its Apco two-stage turbine type pumps are announced by Aurora Pump Div., New York Air Brake Co., Aurora, Ill.

A revised shell housing design directs the fluid from the first to the second stage impeller in a 180° cross-over.



By thus placing in opposition the resultant forces of first and second stages, the forces are equalized and a condition of balanced radial loads is achieved, the company says. At the same time the arrangement eliminates shaft deflection.

Removable channel rings are said to provide for easy and inexpensive replacement of eroded or corroded surfaces. Wear, reduced to a minimum by absence of metal-to-metal contact within the pump channel, is said to permit the handling of free-flowing or even non-lubricating liquids almost indefinitely without wear.

Within each series the capacities can be increased or decreased merely by changing the channel rings and the impeller. The pump can be converted to right-hand or left-hand operation in the field without special parts.

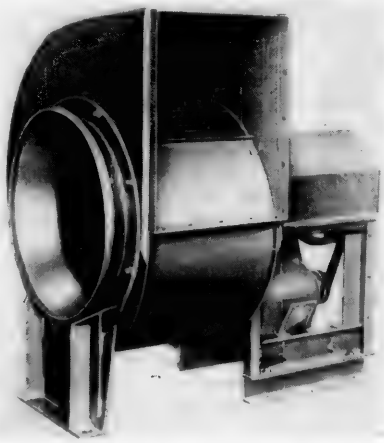
Capacities range up to 150 gpm and pressures up to 300 psi. They are especially adapted to such applications as: boiler feed, condensate return, fresh water service, brine service, ice water circulation, filter service, LPG service, transfer service, caustic liquid handling, sprinkler service, spraying service, water treatment, and booster service.

More information? Circle Item 50, postcard, last page.

V-Belt Driven Fan Sets

A line of V-belt driven Ready Unit fan sets is announced by Clarage Fan Co., Kalamazoo, Mich. These ready-to-run units are furnished complete with motor and drive integrated in one assembly.

Fan sets are suited to supply or exhaust jobs, indoors or outdoors, for volumes to 25,000 cfm, static pressures through 2½ inches, and temperatures to 300 deg F, the company states. Sturdy and quiet, units are said to be



well fitted for ventilating, spot cooling, supplying process air, and exhausting fumes in buildings of all types, all sizes.

Type LS fans have low speed, forward curved multi-blade wheels and are offered in 13 sizes; Type MS have medium speed backward inclined blade wheels and are available in twelve sizes.

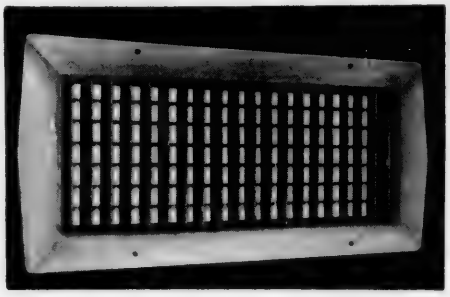
Among the features of this line are: Complete accessibility to motor, drive and bearings; ease of changing discharge direction in the field; entire drive is within frame of unit; ease of motor and drive adjustment; wheel balanced both statically and dynamically; each unit given a running inspection test at specified operating speed; better motor ventilation; and heavy-duty construction throughout.

More information? Circle Item 51, postcard, last page.

Nylon Registers and Grilles

Nylon injection molded grilles, registers, and curved blade diffusers are offered by AirGuide Plastics Corp., Miami, Fla. The company's initial entry into the air outlet field with round molded ceiling diffusers was announced last winter. These have now also been converted to nylon.

Called the Aristocrat 400 Series, the line offers contour



design and two-tone gray color-styling. According to the manufacturer, the high-density nylon permits higher jet velocities without whistling or roaring. Also, as an integral part of the molded design, the products feature permanent, air-tight closure against wall or ceiling without the use of gaskets.

Grilles are available in single and double deflection types with individually adjustable air-foil bars. Tension lugs fitted into the frame eliminate spring wires and rivets, with the result that there are no parts to work loose or flutter, the company states. Units are offered in popular sizes with choice of either vertical or horizontal bar mountings,

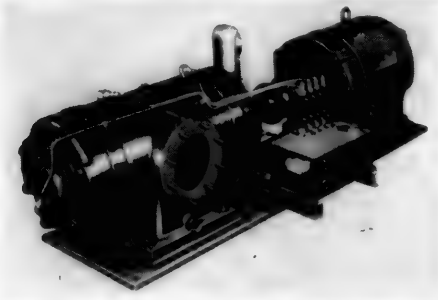
Registers are available in multi-louver and opposed-blade damper types, to satisfy both commercial and year-round residential requirements.

More information? Circle Item 52, postcard, last page.

Rotary Booster Compressors

Addition of a series of rotary booster compressors to its line of refrigeration and air conditioning equipment is announced by The Vilter Mfg. Co., Milwaukee, Wis.

Available for use with ammonia, refrigerant-12 and refrigerant-22, the rotary booster is designed for low



temperature applications and will fit readily into multi-stage systems as the first or booster stage. Ranging in capacity from 4 through 400 tons of refrigeration, depending upon compressor size and operating conditions, units feature high efficiency, compactness, versatility of application and ease of maintenance, the company states.

Because of the absence of all reciprocating parts, vibration and shock are said to be eliminated, resulting in smooth and steady operation. Of the sliding vane type, the booster is internally lubricated by means of a mechanically driven force-feed lubricator.

Unit is especially suited for use in packing plants, dairies, cold storage warehouses or any other industry where low temperatures are required for process work.

More information? Circle Item 53, postcard, last page.

Bellows Expansion Absorber

Introduction of a bellows type expansion absorber for all hydronic heating systems is announced by Cobra Metal Hose, Chicago, Ill. Manufactured of hydrostatically

formed bronze bellows with a copper sleeve and copper male tube ends, the expansion absorber is available in ¾, 1, 1¼, 1½ and 2-inch ID sizes. Movement of ½ inch is provided.

A hygroscopic seal located at the ends of the sleeve seals out foreign matter and seals in moisture that may collect on the bellows. Each unit is tested and inspected and is available for immediate delivery.

More information? Circle Item 54, postcard, last page.

Temperature Regulating System

A low-cost air controlled temperature regulating system has been developed by Spence Engineering Company, Inc., Walden, N.Y., to provide extremely accurate temperature control for systems subjected to wide and sudden load swings. By the cascading of an air signal to a pressure regulator, the company has been able to produce a relatively inexpensive but highly accurate temperature control system.

Immediate response to sudden changes in demand is made possible by the pressure regulating action of the externally piloted main valve. Precise temperature control is obtained from the cascaded air system which loads the pilot. By combining both functions in one simple and easy-to-maintain system, the company has eliminated the need for the pressure reducing valve so often required ahead of the diaphragm-motor valve in instrument control systems.

Quick response of the new temperature system is based on a bimetal temperature sensing element. The temperature pilot continuously regulates a loading air pressure. This loading signal when applied to a pressure pilot to reflect process temperatures causes it to reposition the main valve as changes in load require.

More information? Circle Item 55, postcard, last page.

Enters Resistance Heating Field

Unitary Equipment Div., Carrier Corp., Syracuse, N.Y., announces that it will expand its distribution of electric heating products from heat pumps to include two complete lines of electric resistance heating equipment.

For new house construction, the company is offering a complete line of continuous baseboard low-rise units in five sizes. With this system, all exterior walls of the house can be covered, using heating elements placed between blank sections to give a continuous baseboard appearance. Thermostatic controls can be mounted directly on the baseboard unit or remotely on an interior wall.

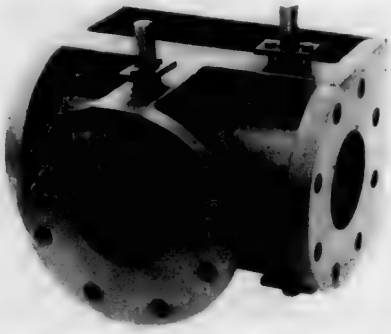
Also introduced is a line of self-contained baseboard heaters intended to supplement heating systems in existing homes when new rooms, enclosed porches and bedroom wings are added. Equipped with a thermostat, they will be available in four sizes, from 2½ to 8 feet in length, and from 300 to 1250-watt capacity.

The wall insert heaters will be offered in four sizes ranging in input capacities from 1500 watts to 4000 watts. They are designed to fit between two-by-four studs, and can be used for entry ways, living rooms, bedrooms and recreation rooms. They are also suited for motel and hospital applications. A forced-air fan for circulation and a built-in thermostat are other features. A closely spaced extruded metal guide will keep children's fingers out of the unit.

More information? Circle Item 56, postcard, last page.

Double Butterfly Valve

The Triangle Valve, a two-in-one valve that does the work of two conventional butterfly valves and a flanged *T* connection is available from U. S. Valve & Engineering Co., Houston, Tex. According to the manufacturer, it gives perfect flow control in cooling water systems and in other applications where two streams flow to or from a single pipe.



Besides replacing the costlier assembly of two valves and a *T*, valve is easier to install and to maintain. It fits piping arrangements with ease, requires no awkward alignment and adjustment. Shaft packing may be removed from either end of the through shaft, inspected, replaced or adjusted without removing the valve. Valve is a single unit—two no-thrust vibration-proof butterfly valves in a flanged *T* body.

Construction is of corrosion-resistant materials and comes with either metal-seated or positive-sealing, Neoprene-seated valves. Bodies are manufactured to dimensions of ASA Class 125 cast iron flanged fittings, ASA B 16a. Available in sizes 1 inch through 12 inches.

More information? Circle Item 57, postcard, last page.

Heavy-Duty Water Heater

The Basmor Hi-Duty, a self-contained, two-thermostat, automatic storage type water heater, is announced by Bastian-Morley Co., Inc., LaPorte, Ind.

According to the manufacturer, the unit may be operated at 180-deg F outlet temperature without temperature and pressure build-up caused by frequent low gallonage draws, such as occur with automatic commercial dishwashers. Under normal operation, the lower thermostat controls water temperature. However, if build-up conditions raise the top of tank temperature beyond the setting of the lower thermostat, the upper thermostat cuts out and holds main burners off, preventing excessive temperature build-up.

Multiple flues (4 in the 75-gal size and 6 in the 85-gal size) insure greater fuel conversion and operating economy; new built-in flue collector simplifies installation, the company states. Other features include self-operating diaphragm gas valve, 100% safety shut-off, pilot gas filter, gas pressure regulator, thick Fiberglas insulation, drain cock with hose connection and handy 3 x 4-inch clean-out. Unit is available with either glass-lined or galvanized tank, for use in restaurants, motels, stores, schools, and apartment houses. Two temperature hot water is easily obtained when required.

More information? Circle Item 58, postcard, last page.

Short Radius Fiber Bends

L-M Permaline 45° and 90° short radius fiber bends are being manufactured by Line Material Industries, McGraw-Edison Co., Milwaukee, Wis., in the 3-inch size.

These bends simplify installation of fiber pipe runs,

sewer lines, drain systems, and septic systems. Features that assure efficient service performance are smooth inner surfaces, water and corrosion resistance, and high strength, the company states.

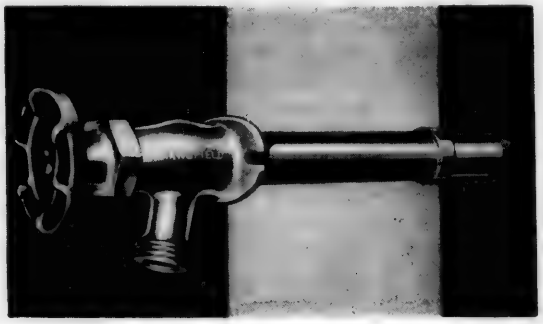
Also offered is a complete line of perforated and non-perforated fiber pipe in diameters up to 8 inches and lengths up to 10 ft.

More information? Circle Item 59, postcard, last page.

Frost-Proof Wall Hydrants

A line of improved frost-proof wall hydrants is announced by Mansfield Sanitary, Inc., Perrysville, Ohio.

The valve's oval flange provides quicker, more secure installation the company says. Also, hydrants are now



furnished with a nickel-plated sillcock body that resists corrosion and provides a long lasting, attractive appearance.

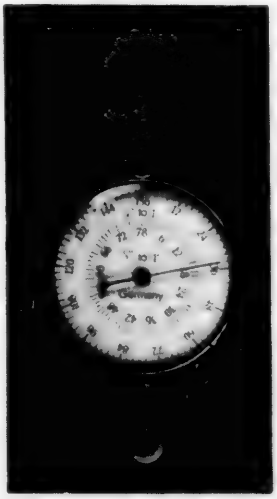
These wall hydrants control water supply through a valve seat located within the building, at the end of an extra-long stem. Besides preventing possibility of freezing, they eliminate need for inside cut-off valves. They also do away with necessity for seasonal inside turn-off of sillcocks.

Hydrants are available in three models: No. 375 has ½-inch thread and sweat connections; No. 376, ¾-inch thread outside and ½-inch thread inside; No. 377, ¾-inch sweat outside and ½-inch sweat inside.

More information? Circle Item 60, postcard, last page.

Blueprint Measurer

A blueprint measurer is announced by American Map Co., Inc., New York, N. Y. It is designed to give quick and accurate readings for almost any blueprint or plan, the company states.



One side of the reader is scaled ¼ inch equals 1 ft and ½ inch equals 1 ft; the reverse, 3/16 inch equals 1 ft and ⅜ inch equals 1 ft. Readings are direct from the dial, with no interpolation or calculation required.

The instrument is made of a nickel-alloy steel and is non-corrosive.

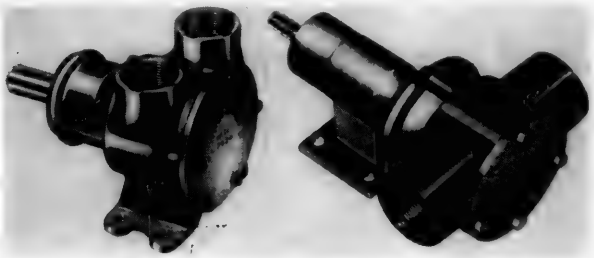
The company publishes a line of maps, tradenamed Cleartype, in black and white, for use in mapping out sales territories and campaigns. Two other measuring instruments are also available; one especially calibrated for the detail maps published by the United States Coast and Geodetic Survey.

More information? Circle Item 61, postcard, last page.

Two Self-Priming Pumps

Two self-priming pumps are added to the line of Jabsco Pump Co., Costa Mesa, Calif.

Model 7420, illustrated at left, has 1¼-inch vertical ports, is of bronze construction, and is designed for foot-mount installation in the marine, farm, industrial, and chemical fields. Unit is equipped with mechanical shaft seal, replaceable seal seat, reversible wear plates. Self-priming at all speeds, the pump's vertical dry suction lift



approaches 15 ft. Its only moving pump part is a Neoprene impeller. At 2450 rpm, unit will deliver 72.5 gpm against a 10-ft head.

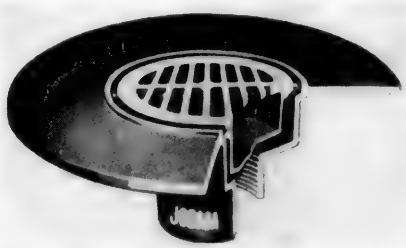
Model 7810, illustrated at right, is designed for general transfer applications in chemical, pharmaceutical, food, and general industries. It consists of a phenolic type plastic body, a Neoprene impeller, replaceable stainless steel wear plates, stainless shaft supported by oversize sealed ball bearings, mechanical shaft seal. Its one-inch inlet and outlet ports accommodate standard one-inch pipe fitting. Capacity is same as Model 7420.

More information? Circle Item 62, postcard, last page.

Drain for Roof Decks

A roof drain developed for use on sun decks, promenades, recreational areas and similar purposes is offered by Josam Mfg. Co., Michigan City, Ind.

On this type of roof many types of roof deck coverings are used, the company explains, such as the Dex-O-Tex Weatherwear roof deck covering. For use with this type of product Josam has designed Series No. 7780 roof drain with an extra wide flange to provide ample surface



for attaching the roofing. The drain may also be used as a floor drain in tiled floors.

In addition to the extra wide flange, the roof drain has a sediment bucket to prevent entry of debris into the leaders. The heavy anti-tilting grate is provided with perimeter drainage slots to permit greater free drainage area.

More information? Circle Item 63, postcard, last page.

Prefabricated Air Chamber

A one-piece prefabricated air chamber that is reported to remove hammer and chatter from water systems is introduced by Wolverine Tube Div., Calumet & Hecla, Inc., Allen Park, Mich. Trade-named Tap/Trap, the air chamber provides savings in time, labor and materials for plumbing contractors and their customers, the manufacturer states.

Unit is prefabricated by the company's "spun end process." It can be installed directly into each supply line

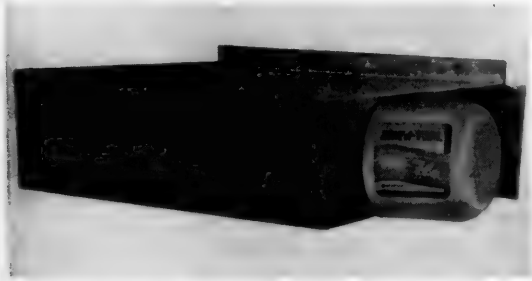
in the system by making only one soldered joint. This eliminates work formerly necessary in installing air chambers—cutting a length of pipe, attaching a cap at one end, reducing the assembly at the open end, and soldering this handmade chamber into the line.

The air chamber is available in six-inch and twelve-inch lengths. Longer lengths can be produced to meet special requirements. Overall diameter is one inch which is reduced at one end to half-inch nominal size for use in standard fittings.

More information? Circle Item 64, postcard, last page.

Motorized Damper Actuators

A new line of low voltage, motorized Zone-A-Trol damper actuators, that provide an easy, low-cost method of installing room-by-room temperature control on any new or existing air conditioning or warm air heating system, is available from Econo Products Co., East Haddam, Conn.



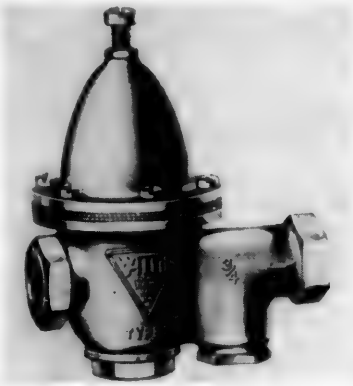
Installed on the air supply ducts to each room or zone, each damper actuator is controlled by a corresponding thermostat. As the thermostat calls for heating or cooling, the Zone-A-Trol automatically opens the damper and lets the air flow until the thermostat is satisfied, and then automatically closes.

By automatically controlling the temperature in each room, these damper actuators are reported to eliminate the problems of cold rooms and rooms that overheat, besides offering many other advantages in the way of more comfort and lower fuel cost. On residential cooling systems, damper actuators permit the full cooling load to be shifted to living areas during daytime hours, and to bedroom areas for comfortable night time sleeping, thereby making it possible for 2 and 3-ton cooling units to be installed and provide a degree of cooling comfort previously obtainable only with larger equipment, according to the company.

More information? Circle Item 65, postcard, last page.

Water Pressure Reducing Valve

A water pressure reducing valve with an integral by-pass check valve is announced by Watts Regulator Co., Lawrence, Mass. In addition to reducing high water pressure, the valve, designated No. 135B, also prevents dripping from the heater relief valve which normally would relieve due to thermal expansion pressure. It is expected that this feature will be welcomed by contractors because it will eliminate unnecessary call-backs due to dripping relief valves.



Use of a pressure reducing valve normally creates a closed system, the company explains. The check valve feature provides the advantages of an open system by allowing water to escape back into the supply main. Under normal operation the check is held closed by street main pressure, preventing any flow of water through it into the system. When water is heated in a closed system, however, it expands, causing system pressures to increase. If system pressure increases even slightly above the inlet or main pressure, the check valve opens, allowing water to move back into the supply main.

Application of the valve is limited to installations where the street main pressure is less than the setting of the pressure relief valve. It is available in ½, ¾ and 1-inch sizes.

More information? Circle Item 66, postcard, last page.

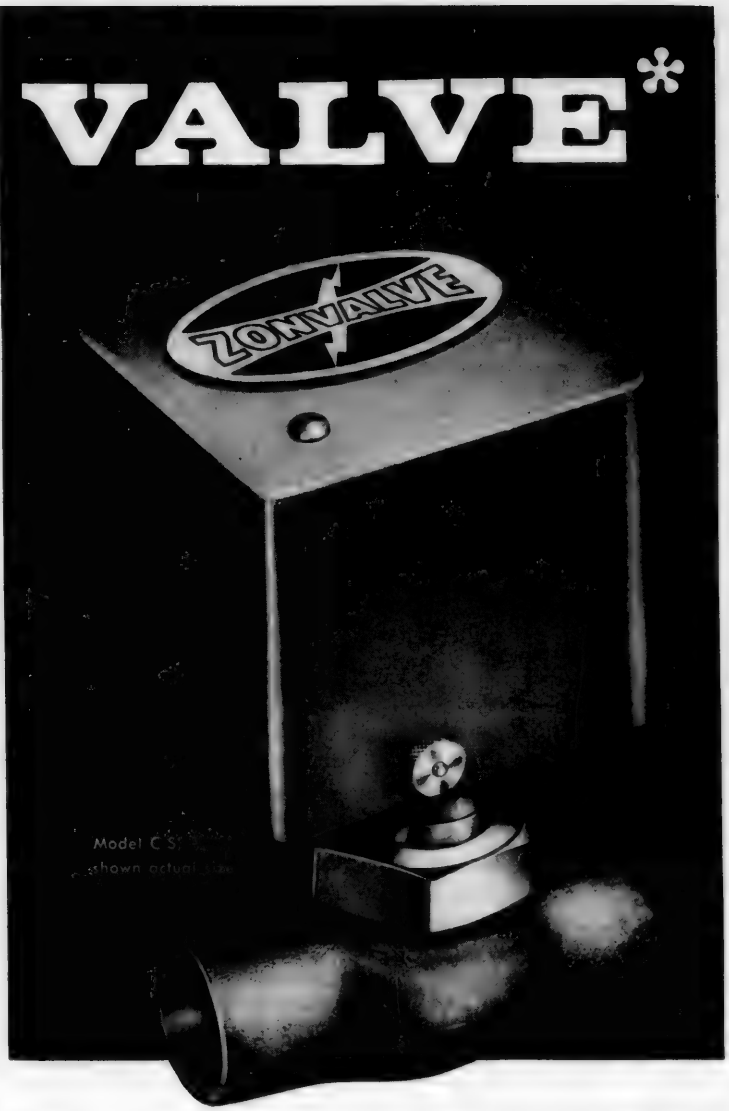
(Continued on page 106)

ZONVALVE*

the zone control valve with

100% SHUT OFF

for positive temperature control!



Globe-type construction of Zonvalve guarantees complete shut-off on steam, hot and chilled water systems. This means positive temperature control, without heat waste.

Engineer-architects and heating men recognize the superiority of Zonvalve's design features. Self-aligning plug insures positive closure and eliminates jamming. Valve is powered by a heavy-duty motor, with pinion, gear and cam assembly—for extra-long life and silent, dependable operation. Zonvalve's "hand-size" compactness makes installation possible where space is limited. Zonvalve is the *only* valve that uses Teflon for a self-lubricating, permanent seal.

Zonvalve is competitively priced. Built to last a lifetime, *it is the only zone control valve with an unconditional written Five-Year Guarantee!*

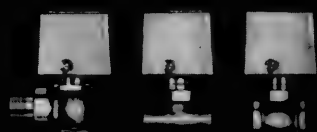
Zonvalve is ideal for modernization and new construction, in residential, commercial and industrial zone heating. For the finest in zone control equipment—specify Zonvalve, install Zonvalve!

New color brochure contains layouts, applications, customer benefits, technical data and prices. Write for Brochure D-12.

ZONVALVE

* This Trade-Mark is registered by Heat-Timer Corp., manufacturers of heating controls and motorized valves since 1935. It is your guarantee of positive zone control.

ZONVALVE MODELS



RS-A C-S S-S

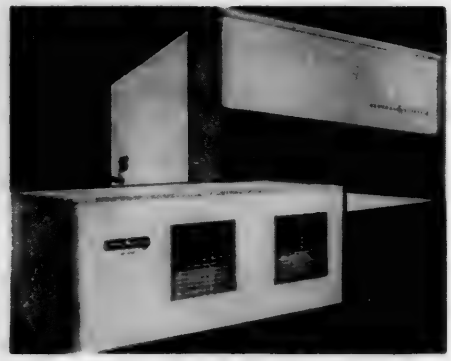
AVAILABLE IN SIZES FROM [illegible] TO [illegible]

HEAT-TIMER CORP.
657 BROADWAY, NEW YORK 12, N.Y.

(Continued from page 104)

Four-Ton Heat Pump

A four-ton Weathertron split-system heat pump is available from Air Conditioning Dept., General Electric Co., Tyler, Tex. The outdoor unit is housed in an attractive, two-tone, weather-resistant cabinet, and features full-hermetic compressor; large, permanently lubricated ball bearing blowers; high-quality blower motors; electrically operated, positive-acting 4-way switchover valve; unified,



automatic electrical controls for heating, cooling, and fully-automatic defrosting; high efficiency driers; and service valves to simplify installation and start-up.

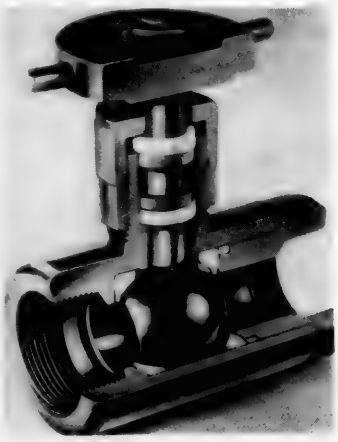
Units are available in both vertical and horizontal models, and feature belt-driven, adjustable-speed blowers with permanently lubricated ball bearings, and operate on both 115 and 230 volts for ease of application. They are designed for easy installation in both residential and commercial applications.

Weathertrons are now available in integral models of 2½ and 3 tons capacity, and in split-system units of 2½, 3, 4, and 5 tons.

More information? Circle Item 67, postcard, last page.

Rigid Vinyl Ball Valves

The successful use of rigid vinyl ball valves in piping systems where corrosion has long been a problem has been announced by Jamesbury Corporation, Worcester, Mass.



Except for the seats and seals, the valve is made of Geon, a vinyl material supplied by B. F. Goodrich Chemical Co., Cleveland, Ohio. It is said to offer superior resistance to oils, acids, alkalies and most chemicals. According to the manufacturer, thousands of test cycles conducted with the new valve have proved the effectiveness of its seal either at full pressure or at vacuum.

Available with threaded ends, weld ends or flanges, the vinyl valves are self-compensating for changes in pressure or temperature. There is no problem of galling or seizure and no lubrication is needed, the company states. Since rigid Geon weighs less than metal, shipping weights are lower and installation is easier.

More information? Circle Item 68, postcard, last page.

High Temperature Dust Collector

A dust collector, introduced by Pangborn Corp., Hagerstown, Md., has been developed specifically to solve air pollution problems arising from high temperature fume and dust emissions.

The Type "CO" cloth tube collector is designed for use with glass filter fabric, although it performs equally well with any type of filter fabric. Use of glass permits efficient filtration at temperatures as high as 550 deg F where natural and synthetic fabrics are unsuitable, the company reports.

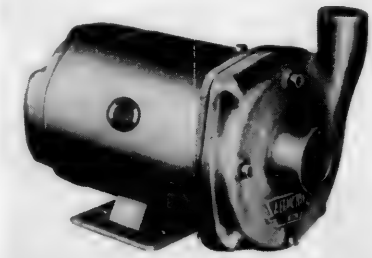
Dust is collected on the inside surfaces of the filter tubes which are cleaned by the company's "pressure-jet" method. A simple jet inside each filter tube provides short blasts of higher pressure air, alternating with a small amount of reversible air flow from the main fan. This partially collapses the tubes, cleans the filter surfaces, and deposits the residue into storage hoppers for easy disposal.

More information? Circle Item 69, postcard, last page.

Compact Centrifugal Pumps

Realizing that compactness and light weight are appreciated in a general utility pump, Aermotor Co., Chicago, Ill., has designed four easy-to-handle, low-priced models to meet the demands for a truly small pump.

Available in ⅓, ½, ¾, and 1-hp units, Series CN pumps weigh only 36, 39, 44 and 49 lb respectively. Each model is equipped with handy steel mounting feet which require no expensive or heavy foundation.



The pump casing may be turned on the motor to give horizontal or vertical direction to discharge opening. The casing is equipped with both a drain and vent opening. The brass impeller is precision machined and balanced. The rotary shaft seal is sand-resistant. The capacitor-type motor requires a low starting current, has stainless steel drive shaft, and has built-in thermal overload protection.

More information? Circle Item 70, postcard, last page.

(Continued on page 108)

Climate by Chrysler

. . . more than just coolness, costs less than you'd expect!

When you select Chrysler Air Conditioning, you have the largest choice of units in the industry. And every unit includes—as standard equipment—important features that would cost up to $364 to add to conventional air conditioning.

The Chrysler line of packaged air conditioning contains almost 300 combinations of water-cooled and waterless equipment . . . in capacities from 3 to 45 tons. You'll get exactly the right model and capacity for your job—never under or over-sized.

And every unit will be complete with features found as standard equipment on no other air conditioning. Mild weather control, oil purifier, electronic safety controls, quick-response expansion valves. And you can specify optional accessories like Chrysler's exclusive electrostatic air purification system and all-weather operation control.

Climate by Chrysler means more than just coolness. Your clients will enjoy low-cost year-around comfort that only true air conditioning can provide. That's the reason more businesses do more business with Chrysler Airtemp—the company that pioneered packaged air conditioning. Get all the facts. Write: Airtemp Division, Chrysler Corp., Dept. I-129, Dayton 1, Ohio. Canadian Distributor: Therm-O-Rite Products, Ltd., Toronto, Ontario.

CHRYSLER
AIRTEMP

FIRST WITH THE FINEST IN AIR CONDITIONING

with *Alnor*® VELOMETER

A simple, direct reading on the Alnor Velometer gives you instant measurement of actual air delivery in any distribution system. This fast, precise method eliminates the time and money wasted in trial-and-error balancing...the profit-eating call-backs so often necessary with other less precise measurements.

The Velometer is the only instantaneous, direct reading air velocity meter—accurate in all ranges, from high to low... compact, portable, easy to understand and use. Wide assortment of jets and fittings makes this precision instrument ideally suited for all air velocity measurement.

First Choice of Industry

Take the recommendation of every major manufacturer of air diffusers and leading contractors—get an Alnor Velometer. You'll save time and money on the next installation you balance.

Alnor PRECISION INSTRUMENTS FOR EVERY INDUSTRY

Illinois Testing Laboratories, Inc.
Room 514, 420 N. LaSalle St.
Chicago 10, Ill.

Please send Velometer Bulletin 2448-G.

Name.....

Company.....

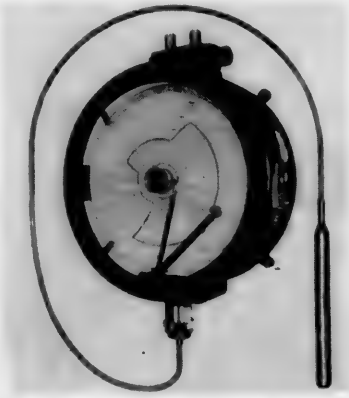
Address.....

City.....Zone.....State.....

(Continued from page 106)

Steam Recording Control

Model RCA recording pneumatic temperature program control is introduced by The Partlow Corp., New Hartford, N. Y. In addition to its control features, it also is a temperature recording instrument. It is particularly well adapted in locations where steam is used as a heating medium, the company states.



According to the manufacturer, the control was designed to provide a simple and rugged method for program controlling heating appliances that would, at the same time, give accurate and sensitive proportioning valve operation, plus recording. It is available in any of ten optional temperature ranges between minus 30 and plus 1100 deg F. Unit actuates an air-operated throttling valve controlling the flow of steam, water, or gas or to operate other air-operated devices. A plastic cam is cut to the desired temperature range, either at the factory or in the field.

More information? Circle Item 71, postcard, last page.

Redesigned Room Units

The first major style change in four years, lighter slimmer and quieter models, larger capacities and easier installation mark its 1960 room air conditioners, announces Carrier Corp., Syracuse, N. Y.

Seven model lines range from portables to units offering capacities up to 18,000 Btu, and mobile home air conditioners. An "install-it-yourself" Sceptre series, weighing 115 lb and measuring 14 inches deep, in cooling capacities from 7,000 to 9,600 Btu, is included. The Imperial series provides the biggest cooling output, with an 18,000 Btu model for larger rooms in areas of high heat and humidity.

Heat pump units are represented by the Regal line, but portables will also serve as heat pumps when turned around in the window.

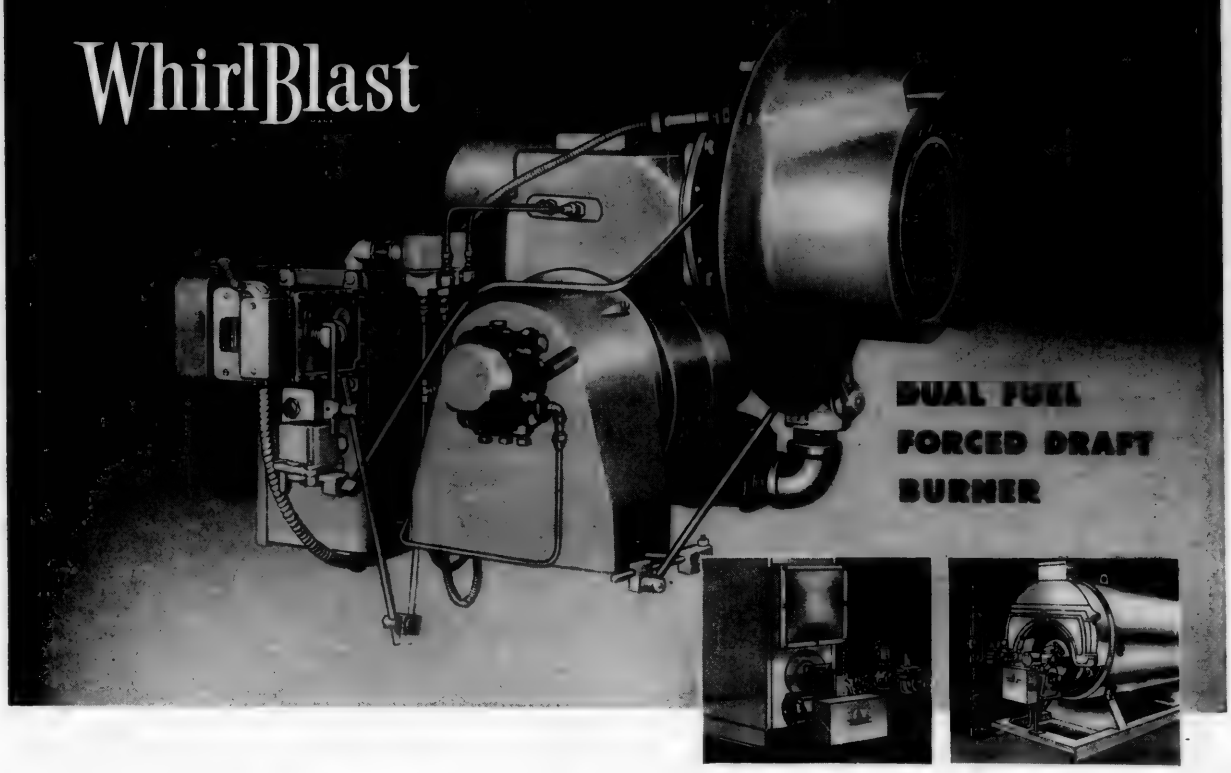
In most models, according to the company, sound level has been reduced along with depth of cabinet. For added convenience, a portion of the grille is held by magnets and can be easily lifted for filter replacement or inspection. The top section deflects air upward in its normal position, but can be tilted forward for horizontal airflow.

More information? Circle Item 72, postcard, last page.

(Continued on page 110)

A new development by Iron Fireman

WhirlBlast



Makes firebox boilers super-efficient

NO SMOKE

Burns clean in less than 10 seconds. The WhirlBlast flame is brilliantly clean almost instantly, and stays clean. Although accepted standards of oil firing allow a 15 minute warm-up period, during which time smoke is tolerated, the Iron Fireman WhirlBlast burner is clean in seconds. Smoke and soot are unburned fuel—completely wasted by smoky starts.

NO STACK

Needs only an exhaust vent. Boilers with conventional burners require from 30 to 80 feet of stack or an induced draft fan. Sealed steel firebox boilers with WhirlBlast burners require only a small exhaust vent.

CONSERVES BOILER HEAT

Standby loss is almost nil. The highly efficient WhirlBlast burner does not need a refractory combustion chamber to "support combustion." Consequently there is no brickwork to store heat to be wasted during "off" periods. Standby heat loss is reduced to an insignificant minimum.

CUTS COSTS

Low fuel bills; low maintenance. Efficient combustion and low standby loss conserve fuel. Elimination of smoke and soot means no fouled boiler tubes, no carboned nozzles or electrodes; no refractory maintenance expense.

A COMPLETE PACKAGE

No special skill to install, adjust, service or operate. The WhirlBlast burner (for gas, oil or dual-fuel combination) comes from the factory fully wired and tested. Bolts to boiler front with firing head through fire door. No special combustion chamber or firing pit needed. Exceptional installation saving.

Send coupon for further information.

IRON FIREMAN®
AUTOMATIC FIRING EQUIPMENT
FOR HEATING, POWER, PROCESSING

IRON FIREMAN MANUFACTURING COMPANY
3158 W. 106th Street, Cleveland 11, Ohio

(In Canada, 80 Ward Street, Toronto, Ontario)

Please send me more information and specifications on the Iron Fireman WhirlBlast burner.

Name.....

Firm.....

Address.....

City..... Zone..... State.....

Quickdraft... THE WORLD'S SAFEST

POWER DRAFT UNIT FOR INDUSTRIAL, RESIDENTIAL AND INSTITUTIONAL EXHAUSTING

Increases heating and combustion efficiency!

Provides air power for bulk materials handling!

Exhausts corrosive gases and abrasives!

Quickdraft provides industry, commerce, institutions and homebuilders *power draft* engineered for economical and efficient combustion regardless of building or atmospheric conditions. Models suitable for every heating or incinerator application . . . eliminate pulsating or chattering, puffing, smoking and sooting. Reduce building costs, no tall, unsightly stacks required. Quickdraft also provides industry with ¼ inch to 60 inches W.G. static pressure for exhausting corrosive gases, abrasives and paint spray. Heavy-duty, high-pressure models, 6 inches to 30 inches diameter, are available for moving bulk materials or anything that can be moved by air. Because there are no motors, fans or bearings in exhaust line, only Quickdraft avoids costly clogging, corrosion of moving parts or fan failure.

IMPORTANT NOTICE

For withstanding corrosive gases, all Quickdraft units are available in standard acid resisting vitreous enamel, No. 316 Stainless Steel, rigid plastics (P.V.C.) and with plastic and Fiberglas coatings.

N-622-QD

NO MOTORS FANS OR BEARINGS IN EXHAUST LINE

Send for QUICKDRAFT ENGINEERING DATA on your application . . . now.

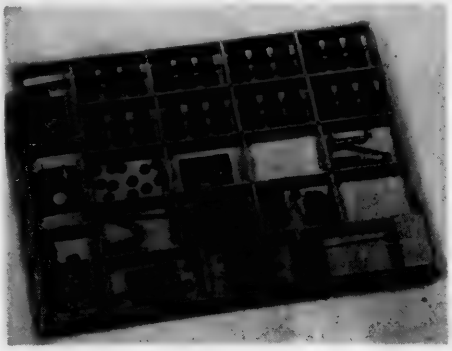
Quickdraft CORPORATION

P.O. Box 87—O Canton 1, Ohio

(Continued from page 108)

Switch-Making Kit

A special switch-making kit is announced by Detroit Controls Div., American-Standard, Detroit, Mich., for use by designers in developing switch combinations for special applications. Containing the company's miniature snap-action Tyni-Switches, the kit is the first to be offered designers to aid them in their development problems.



Thirty-two single pole, double throw Tyni-Switches available in the kit provide a representative assortment of Class 2 and Class 4 switches which may be used to simulate a multitude of combinations, and also to build multipole switches. Switch models developed from the kit can be used as samples for production purchases. The switches are available in single throw, normally open or single throw, normally closed models. These can be selected from Bulletins 263 and 270. Both bulletins are in the kit.

Eight varieties of actuator assembles and 12 sets of assembly screws and nuts for stacking combinations of Tyniswitches are included. All switches in the kit are 15 amp, ½ hp, 125 and 250 volt a-c, and are approved by Underwriters' Laboratories, Inc.

More information? Circle Item 73, postcard, last page.

Heating Boiler Line Expanded

Federal Boiler Co., Midland Park, N.J., announces the re-design and expansion of its entire commercial-industrial heating boiler line. It now offers a complete selection of more than 88 sizes and models. The boilers range in size from 1780 through 64280 sq ft steam, and are available in gas-fired and oil-fired models.

The re-designed models are in three series: FLW low water line boilers; FLR horizontal fire tube boilers; and FMA and FMB scotch marine boilers. All incorporate new design advantages including rugged door designs; increased efficiency in insulating properties; improved windbox design for the burning of modern fuels; and increased efficiency in combustion.

Constructed to rigid standards of the ASME and conforming to rating codes of the Steel Boiler Institute, Federal commercial boilers are supplied either factory-assembled, or job-built in large metropolitan areas by trained factory crews.

More information? Circle Item 74, postcard, last page.

(Continued on page 112)

Best for ductwork or spiral conduit

Bethcon Galvanized Sheet Steel

Here, running side by side, are ductwork and spiral pipe for the heating and air conditioning systems of a large new office building. Bethcon galvanized steel sheets were extensively used in the fabrication of both of these component parts.

Bethcon sheet steel is just right for sheet metal work such as this. First, being steel, Bethcon is strong and rigid, permitting long spans with minimum support. Second, Bethcon is neither too soft nor too hard; it's ideal for easy shopwork and a sturdy end-product. Third, Bethcon's zinc coating is second to none for its refusal to flake or peel off.

Bethlehem's continuous galvanizing process includes a special annealing cycle which gives the steel its desirable strength-with-ductility combination. Seconds later the zinc is applied, and applied so tightly that it permits forming never before considered practical for galvanized steel.

Bethcon is available in a wide variety of gages, with either plain open hearth or copper-bearing (Beth-Cu-Loy) steel for the base metal. Just get in touch with the nearest Bethlehem representative for whatever details you need. Or write direct to our home office.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

IT'S NEW! IT'S TOPS!

it's the Sterlco 4223-E

LOW PRESSURE

CONDENSATE PUMP

☆ SURPRISING VERSATILITY

☆ UNUSUAL CAPACITY

☆ TREMENDOUS PERFORMANCE

☆ ECONOMICAL PRICE

● **DESIGNED SPECIFICALLY FOR SMALL INSTALLATIONS . . .** yet adequate for jobs up to 3000 sq. ft. EDR.

● **ALLOWS ACCURATE ADJUSTMENT . . .** Float switch travel can be adjusted for a draw of from .7 to 3 gals. per pumping cycle for close adjustment to boiler requirements.

● **SMALLER IN SIZE, YET BIGGER IN USABLE VOLUME . . .** a truly believe-it-or-not design. Although the 5 gal. cast iron tank is one of the smallest, it has greater "draw" or usable volume than many pumps with larger tanks.

● **LOTS OF EXTRA CAPACITY FOR EMERGENCIES . . .** Equipped with the same pump and motor used for the larger capacity ¼ h.p. Sterlco pumps.

● **TAKES LESS SPACE THAN ANY OTHER . . .** Occupies only 1.6 sq. ft. of floor space. Fits easily into almost any small corner because of rectangular shape and convenient location of motor and switch at front of unit.

● **EXCEPTIONALLY QUIET, RUGGED, DEPENDABLE . . .** Includes the same high quality features found in Sterlco's heavy duty pumps.

USE THE RIGHT PUMP FOR THE JOB!

The addition of the No. 4223-E makes the Sterlco 4100-4200 Series Condensation Pumps one of the most complete lines of low pressure pumps on the market.

Write now for complete information.

Sterlco Products Distributed Through Leading Heating and Plumbing Wholesalers. Representatives in all principal cities.

STERLING, INC.

5206 W. Clinton Ave., Milwaukee 18, Wisconsin

CONDENSATION AND VACUUM PUMPS

HEATING SPECIALTIES

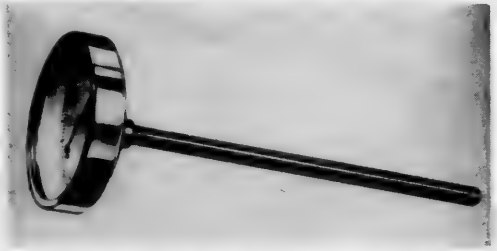
TEMPERATURE CONTROLS

(Continued from page 110)

Thermometer Can Be Reset

Model 142 stainless steel thermometer, designed for laboratory and production use, is offered by Pacific Transducer Corp., Los Angeles, Calif.

A very sturdy instrument that will stand up through long hard use, one of its main advantages is that the thermometer can be reset and recalibrated by the user if such an operation is ever necessary, the company says. Most stem type thermometers have to be returned to the factory for recalibration.



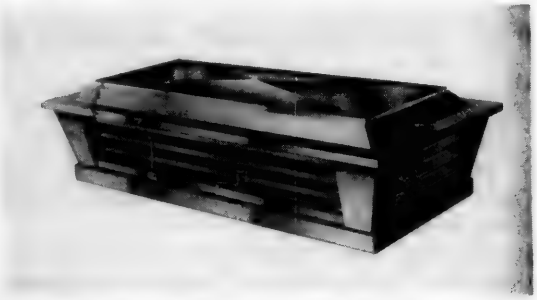
In this case the user can recalibrate the thermometer by placing it in boiling water or by comparing it to the usual standards. The thermometer has a stainless steel stem, tip and mounting which makes it immune to corrosion from most all chemicals for continued use. It is water-proof for intermittent immersion and for continuously humid atmospheres.

Thermometer has a range from 0 to 220 deg F. Stem length is 6 inches with a diameter of ¼ inch.

More information? Circle Item 75, postcard, last page.

Gravity, Power Roof Ventilators

G. C. Breidert Co., San Fernando, Calif., announces the completion of a line of low silhouette, square and rectangular ventilators. These units are sold under the name of Breidert Air-X-Hausters (gravity) and Breidert Powair-X-Hausters (power).



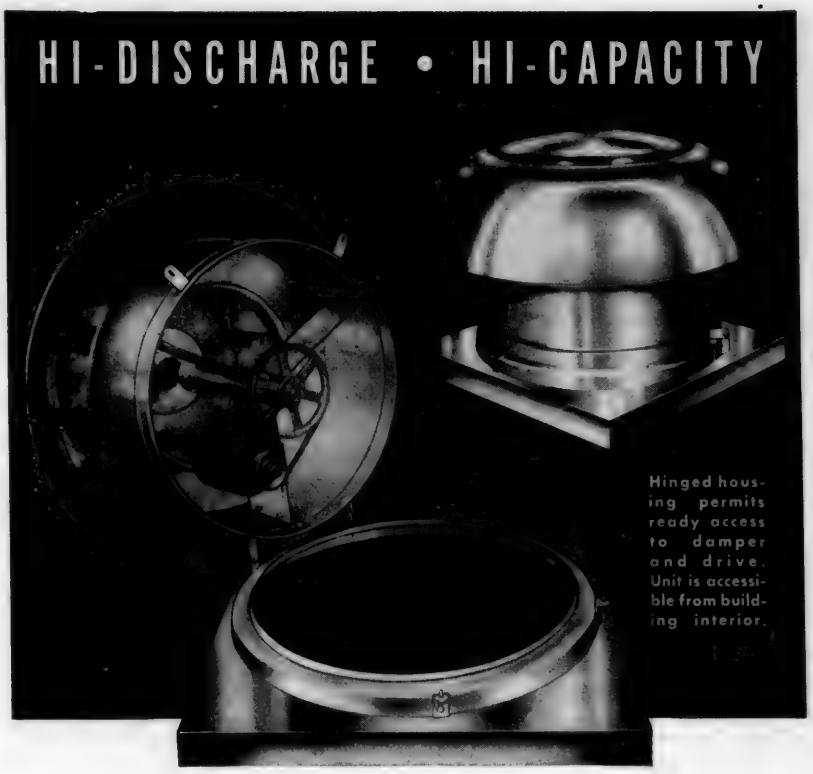
The low silhouette ventilators are now available in a full range of sizes from 10 through 60 inches, and were created specifically to meet the demands of architects and engineers for ventilators with lower silhouettes, and are designed to be compatible with the new low, square and rectangular type buildings.

Capacities of both the power units and gravity units are certified.

More information? Circle Item 76, postcard, last page.

(Continued on page 114)

HI-DISCHARGE • HI-CAPACITY



...new JENN-AIR "HI-D" Power Roof Exhausters

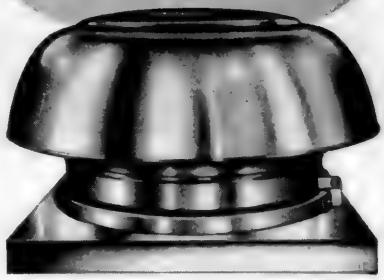
When specifications call for an exhaust fan with BIG air moving capacity, they call for Jenn-Air's new "Hi-D" Power Exhausters. Designed in both axial and centrifugal wheel models, these belt drive units offer capacity ratings in a broad range from 480 to 28,650 cfm.

In addition to high capacity, Jenn-Air "Hi-D" Exhausters provide these important design features:

- Wheel is located above motor to combine high discharge point with an overall installed height lower than any comparably-rated exhauster.
- Non-overloading wheel, made of heavy gauge aluminum, is dynamically and statically balanced in the Jenn-Air Sound Laboratory.
- Exclusive guide vane construction improves air moving efficiency while minimizing turbulence and noise.
- Adjustable motor pulley permits speed variation.
- Totally enclosed motor and tubular drive assembly feature permanently sealed, pre-lubricated ball bearings. Motor is effectively cooled by air stream.
- Bird guard of heavy gauge stainless steel is an integral part of every unit.
- Maintenance-free aluminum housing provides strength without weight.

The HAB Series of "Hi-D" Exhausters (axial blade) gives highest air-per-dollar value in short duct runs where static pressures are negligible. The HCB Series (centrifugal wheel) effectively overcomes static pressures and is usually preferred for long duct runs. Its smaller diameter permits a corresponding reduction in duct size.

JENN-AIR All-Aluminum LOW-CONTOUR RELIEF VENTS

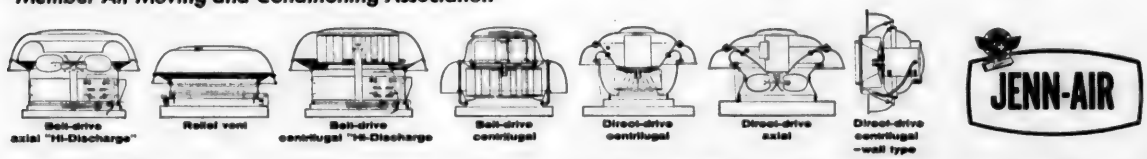


For fresh air intakes or pressure relief within buildings, specify Jenn-Air relief vents. These high-discharge units are designed in seven sizes . . . built to handle from 356 to 18,350 cubic feet per minute. Weather proof, bird proof Jenn-Air relief vents eliminate unsightly goosenecks and hoods.

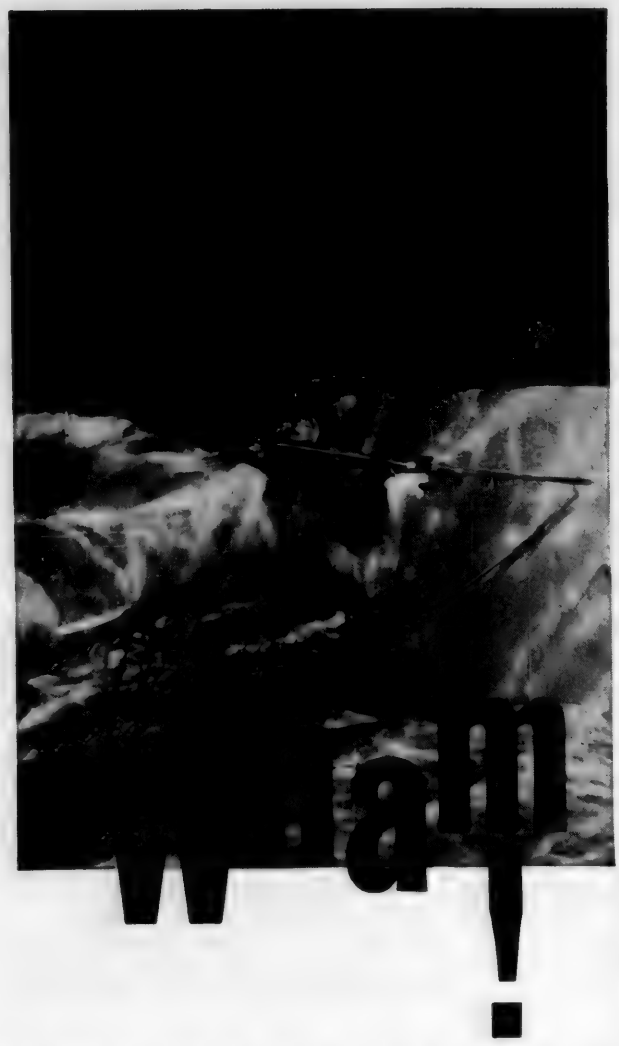
Specially designed hinge on housing permits ready access to damper. Simple locking mechanism keeps unit tightly closed.

Ask your Jenn-Air representative for performance and dimensional data on the complete line of Jenn-Air Power Exhausters and Relief Vents.

Member Air Moving and Conditioning Association



Jenn-Air Products Company, Inc. • 1102 Stadium Drive, Indianapolis 7, Indiana



DEEP SEA HUNTER FAILS TO FLAKE INLAND TI-CO®

More than a match for ferocious 700-pound hammerhead sharks, this compressed-air powered gun fires underwater spears with terrific force. Again and again its high-speed missiles pierced this Inland TI-CO galvanized sheet, yet at the edges around the holes there wasn't a trace of flaking of the zinc coating.

Sheet metal men usually confine their underwater activities to summer vacations, but on the job they've come to know TI-CO as the galvanized sheet that simply won't peel or flake. It's tough, firm, yet soft enough to take the most complicated forming—Pittsburgh lock-seaming or any other tough fabricating process—without difficulty and without make-overs. When you hammer it flat, TI-CO won't spring back—it stays flat. When you use TI-CO, you get an installation you can be proud of, every time!

Ask your Steel Service Center for the TI-CO Brand . . . the galvanized sheet that's tailor-made for sheet metal work.

INLAND TI-CO

AMERICAN STEEL WAREHOUSE ASS'N

INLAND STEEL COMPANY

30 West Monroe Street · Chicago 3, Illinois

(Continued from page 112)

Bimetal Heat Exchanger Tubes

Bimetal condenser and heat exchanger tubes, for applications involving different internal and external corrosive operating conditions, are available from Chase Brass & Copper Co., Waterbury, Conn. The tubes are manufactured in a variety of combinations of ferrous and nonferrous metals, in a considerable range of diameters and lengths.

Major applications for the tube are found in the chemical and petrochemical, food processing, and refrigerating industries, where their use can give reductions in operating and maintenance costs by cutting corrosion problems, giving additional structural strength, and eliminating much expensive replacement and down-time costs for heat exchangers. Construction allows choice of internal and external metals that best suit the particular corrosive environment to which exposed.

Bimetal tubes are available in combinations of cupronickel and other copper alloys with carbon steel, stainless steel and aluminum, as well as tubes of carbon steel lined with stainless steel. Sizes most commonly used are from $\frac{5}{8}$ to 1 inch OD, although the company can supply diameters ranging from $\frac{3}{8}$ to 6 inches OD.

More information? Circle Item 77, postcard, last page.

Special-Application Blowers

Single-inlet blowers for special applications are available from Viking Air Products Div., National-U.S. Radiator Corp., Cleveland, Ohio.

According to the company, the compact blowers are ideal for installation on inlet ducts, against blower cabinet wall panels, in many spaces that are too small for

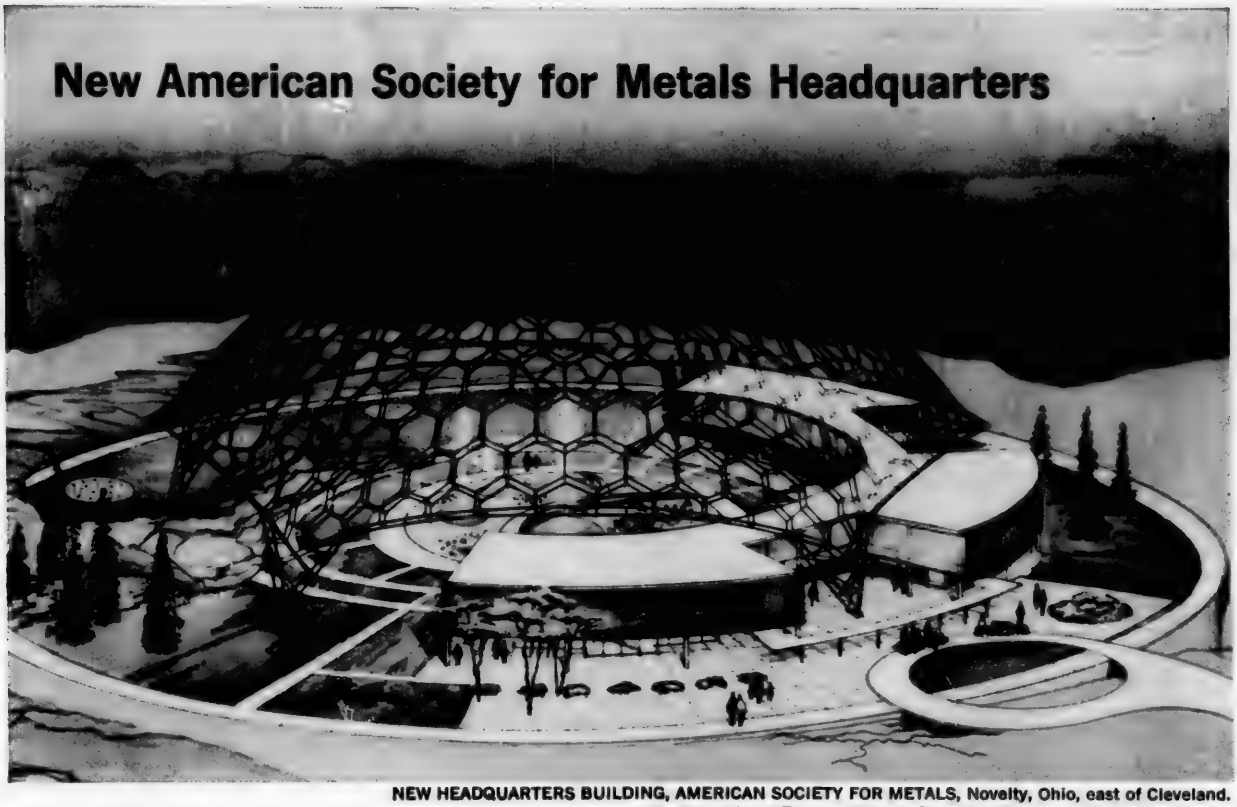
conventional blowers, in certain industrial or chemical applications for confining and/or increasing air or gas flow in ducted systems. In addition, they are said to be especially useful in areas requiring higher pressure and lower volume than can be supplied by standard-width blowers.

Units are available in 9-inch sizes (narrow and three-quarter widths), and 11 and 13-inch sizes (narrow widths only).

More information? Circle Item 78, postcard, last page.

(Continued on page 116)

New American Society for Metals Headquarters



NEW HEADQUARTERS BUILDING, AMERICAN SOCIETY FOR METALS, Novelty, Ohio, east of Cleveland.
Architect: JOHN TERENCE KELLY. *Consulting Engineer:* MAYER AND VALENTINE. *General Contractor:* GILLMORE-OLSON COMPANY. *Plumbing and Heating Contractor:* SPOHN HEATING & VENTILATING COMPANY. *Dome Design:* R. BUCKMINSTER FULLER, SYNERGETICS, INC.

Imagination shows in the building — practical planning in the choice of Jenkins Valves

Metals Park . . . dramatic new Headquarters of the American Society for Metals, is a showcase for the wonderful world of metals.

The geodesic dome, "world's largest space lattice," required thirteen miles of tubing and rods in open-work trellis. It stands as a monument to man's imagination in the use of the raw elements of the earth, as symbolized in the circular Mineral Garden below. At Metals Park, metals are everywhere and everything — providing an ideal background for ASM's many services to 30,000 members in the metal industry.

You would expect men of metals to choose metal-products of superiority for their headquarters. And they did — including Jenkins Valves for *all* plumbing, heating and air conditioning lines. They had good reason: superior metals give Jenkins Valves the extra stamina that makes them famous for long life and dependability.

Whenever a building is planned with the *future* in mind, it's wise to specify or install Jenkins Valves. They're the *practical* choice to assure longtime efficiency and economy — and they cost no more. Jenkins Bros., 100 Park Ave., New York 17.

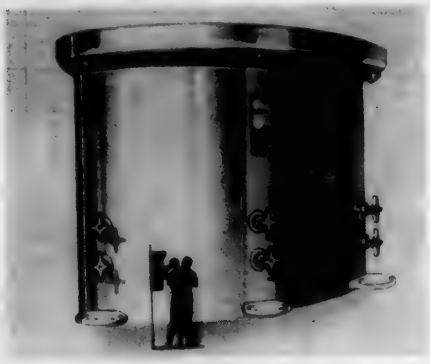
SOLD THROUGH LEADING DISTRIBUTORS EVERYWHERE

JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES
JENKINS SINCE 1864
Jenkins Bros.

(Continued from page 114)

Multi-Person Wall Shower

A wall-mounted type multi-person shower has been developed by Bradley Washfountain Co., Milwaukee, Wis. It is provided with three or two adjustable shower heads, soap trays, and control valve.



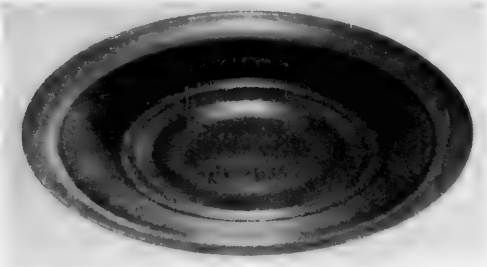
One set of piping connections thus serves two or three shower facilities, with each bather having individual control of water volume and temperature. This shower, shown in the accompanying illustration, is particularly suitable for narrow rooms, the company states. It is self-contained and assembled for mounting on wall at any desired heights.

Enclosing panel, cornice, and cover are made of stainless steel or pressed steel vitrous-enameled and finished in white or selection of colors.

More information? Circle Item 79, postcard, last page.

Non-Adjustable Diffuser

Kno-Draft KF Fixed Pattern overhead air diffuser, especially designed for use when no adjustment of air discharge is necessary, is offered by Connor Engineering Corp., Danbury, Conn. Key features include a built-in damper, urethane foam plastic rim gasket for positive seal between ceiling and diffuser, and air discharge in



single, circumferential pattern that is said to achieve maximum induction to eliminate drafts and to equalize room temperature.

The unit's construction offers alternatives of connecting it to duct collar or securing it to structural supports. According to the manufacturer, styling is smart and simple, with standard baked enamel finish. Several sizes and air delivery capacities are available.

More information? Circle Item 80, postcard, last page.

(Concluded on page 120)

YOUR IDEAS WORK BETTER WHEN YOU WORK WITH HONEYWELL

THE FOLLOWING pages bring you some of the latest developments in automatic controls from Honeywell. They widen your choice of products; give you more to work with.

For complete information on these new control products and systems, call your nearest Honeywell sales office. Honeywell provides 112 sales offices throughout the country. Each is staffed with control specialists to assist you in writing specifications and preparing control layouts.

NOW! FLUTTER-JET WASHING

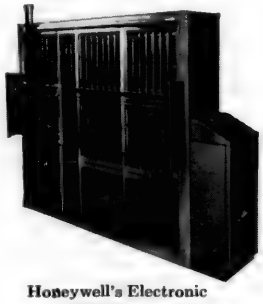
Another first for Honeywell's ELECTRONIC AIR CLEANER

Actual unretouched strobelight photograph taken at 1/2,000 second.

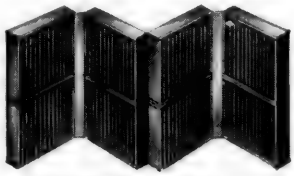
Never before such a quick, efficient way to wash electronic air cleaners! Honeywell's new flutter jet washer literally *blasts* water throughout the air cleaner, with a fluttering, sweeping action that flushes away accumulated dirt quickly—cleans every part thoroughly. The new flutter jet nozzle never clogs.

Honeywell's Electronic Air Cleaner

Removes 90% of all airborne dirt



Honeywell's Electronic Air Cleaner



Honeywell's Activated Charcoal Filter

You can now select from three types of cells: (1) *Hi Velocity*—where space is limited. (2) *Standard*—for normal conditions, provides high efficiency dirt removal and high dirt capacity. (3) *Hi Load* for handling high dirt concentration.

With these 3 different cell capacities, you can have complete freedom in designing your plenums. Just select the cell type and number of cells that will give you the air cleaning capacity you need in the plenum space available. No longer is it necessary to design your plenum to fit the air cleaner.

Remove Odors, Too

For the ultimate in air cleaning, team up Honeywell's Electronic Air Cleaner with the Activated Charcoal Filter—for removal of *odors and gases*, too. Only Honeywell offers this *exclusive* combination.

For more information about Honeywell air cleaning, call your nearest Honeywell office. Or write: Minneapolis-Honeywell, Dept. HV-12-141, Minneapolis 8, Minn.

Honeywell

H HONEYWELL *First in Control*

Now! A master control for your central fan system—

New Honeywell Transistorized control combin

Five adjustment knobs give you finger-tip control of duct temperature from one location

- Adjustment for throttling range of controlling thermostat
- Factory calibration adjustment knob
- Adjustment for outdoor air thermostat effect
- Adjustment for second thermostat effect
- Adjustment for calibration and control point

The following additional features offer you extra protection, extra convenience: rugged mounting case made of 16-gauge steel, reinforced top and bottom; hinged, swing-out panel for easier servicing; easy-to-read terminal connections that reduce chances of wiring errors; separate terminal strip for panel power; ample number of knockouts (seven at top, seven at bottom) for easier installation.

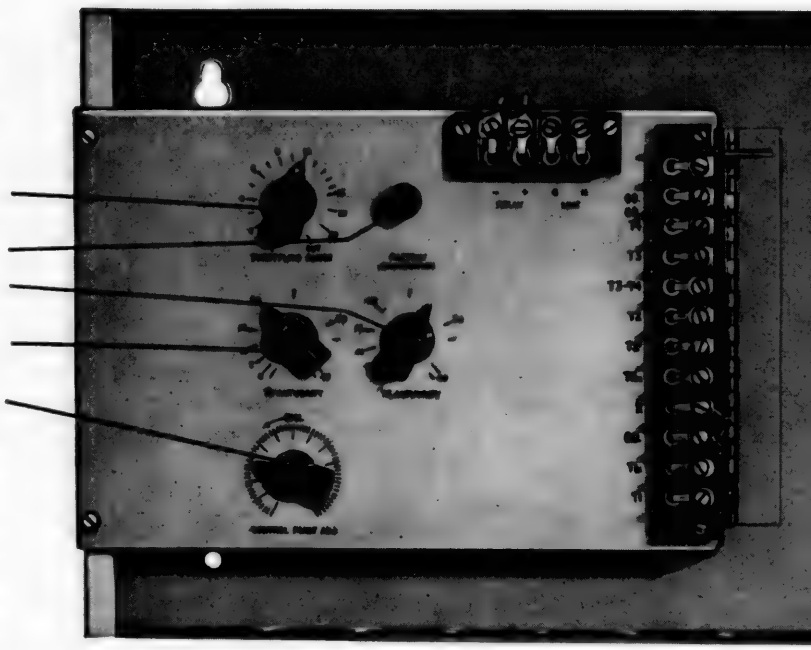
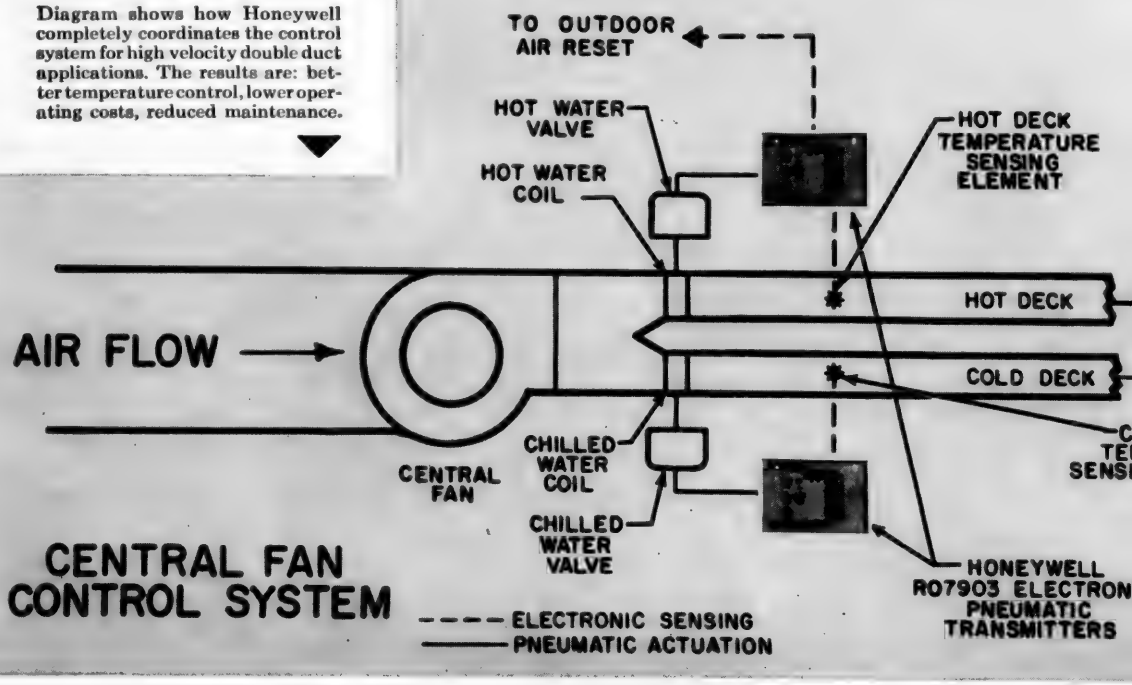
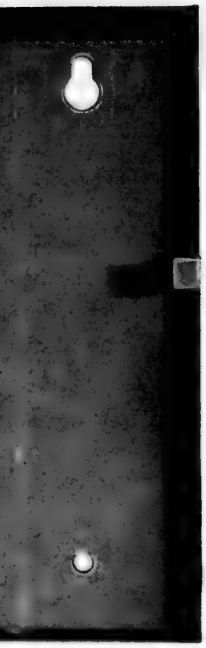
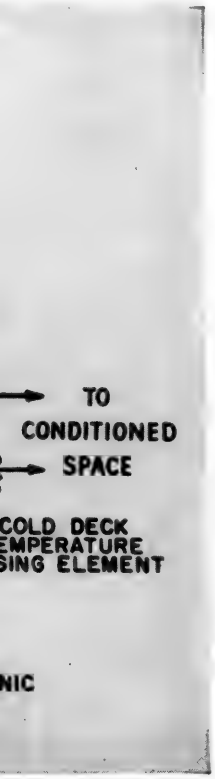


Diagram shows how Honeywell completely coordinates the control system for high velocity double duct applications. The results are: better temperature control, lower operating costs, reduced maintenance.



nes the best of electronics and pneumatics!





This new relay combines the sensitivity and versatility of electronic sensing with the powerful, rugged economy of pneumatic actuation—your assurance of better control performance!

Now you can completely co-ordinate the control of your air conditioning system from a single location! The new Honeywell Electronic-Pneumatic Transmitter eliminates difficult, inexact adjustments at sensor locations—and, there's a free choice of locations because sensors are now adjusted at the central panel.

This new relay combines the sensitivity, freedom from ambient temperature effect, fast response and versatility of *electronic sensing* with the powerful, rugged economy of *pneumatic actuation*. It's the perfect combination of functional advantages needed to do a better control job for you.

Two compact, rugged transistors handle the R07903's power load with plenty to spare—your assurance of trouble-free performance and longer life.

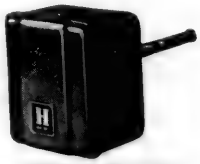
Honeywell's new Electronic-Pneumatic Transmitter offers you a choice of specialized sensing elements as shown below. For more information about the many ways the R07903 can serve you, call your nearest Honeywell office today or write Minneapolis-Honeywell, Dept. HV-12-141, Minneapolis 8, Minnesota.

Honeywell offers you a wide choice of specialized sensing elements for use with the R07903 transmitter!

These elements have no moving parts, require no adjustments and provide faster, more accurate response. They are simple coils of temperature sensitive wire —dustproof, tamperproof, foolproof— that insure your systems long years of dependable, trouble-free service.

Relay connections are made with simple, standard low-voltage wiring, and can be manufactured in various shapes and sizes for easy fitting to each individual installation. Element lengths for duct measurements vary from 4 inches to a special averaging model of 27 feet.

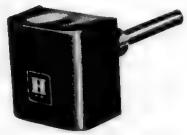
INSERTION ELEMENTS



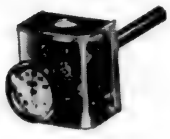
DUCT ELEMENTS

OUTDOOR ELEMENT

AVERAGING DUCT ELEMENT



INSERTION ELEMENT



DUCT ELEMENT

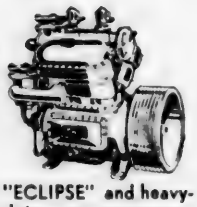
DUAL-ACTING DISCHARGE ELEMENT

Yes!

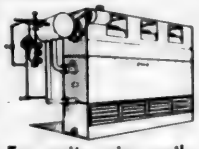
We have all the components

FRICK DISTRIBUTORS *and* FRICK USERS can select from the industry's greatest line of compressors, condensers, coolers, coils and controls.

They also get the advantages of many exclusive Frick engineering developments, a few of which are illustrated. When you or your clients need air conditioning, refrigeration, ice making or quick freezing equipment, in any commercial or industrial sizes, check first with Frick.



"ECLIPSE" and heavy-duty compressors: sizes up to 1,000 tons refrigeration.



Fan units, pipe coils, shell, zig-zag and other types of coolers for air, water, brine, etc.

Valves, Fittings and Controls, for manual or full-automatic operation.

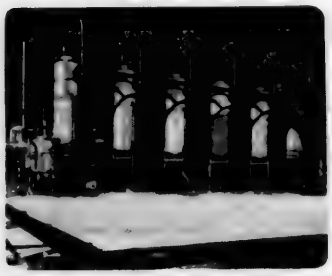
DEPENDABLE REFRIGERATION SINCE 1882

FRICK CO.

WAYNESBORO, PENNA., U.S.A.

Prestfin coils have 9 to 13 times the surface of bare pipe, assure high humidity in storage. Also remove superheat from hot gases.

Evaporative and shell-type condensers.



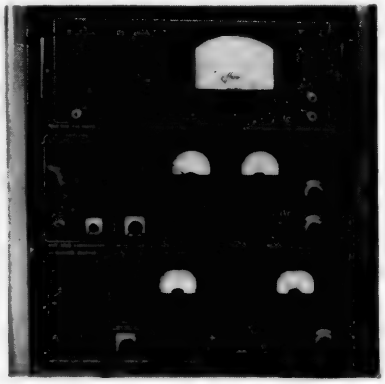
Synthetic rubber and other chemical plants find Frick patented systems the answer to various needs.

Shell-Ice is frozen automatically on stainless-steel tubes, is hard and clear. Preferred in fountains, restaurants, dairies, poultry plants, fisheries, by shippers, etc.

(Concluded from page 116)

Air Turbulence Analyzer

A two channel hot wire anemometer system is introduced by Flow Corp., Arlington, Mass. It measures the intensity and scale of longitudinal and transverse turbulence components for airstream turbulence analysis. This system consists of three instruments: a hot wire anemometer, a sun and difference control unit and a random signal meter, all packaged in a single cabinet ready for operation.

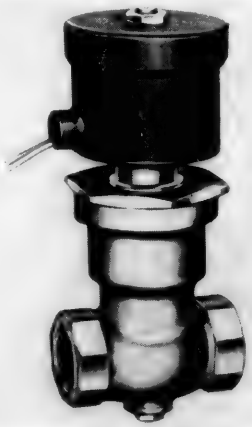


Separate constant current supply and controls for each of two wires; separate d-c bridge circuits for each of two wires; compensated amplifier: 2 cps to 100 kc, .25 uv noise level; square wave calibration; cross correlation circuits; true RMS readout with long averaging time and high peak factor; built in power supplies and built in voltage regulation are all included. Unit weighs approximately 100 lb and measures 23 inches high x 21 inches wide x 16 inches deep.

More information? Circle Item 81, postcard, last page.

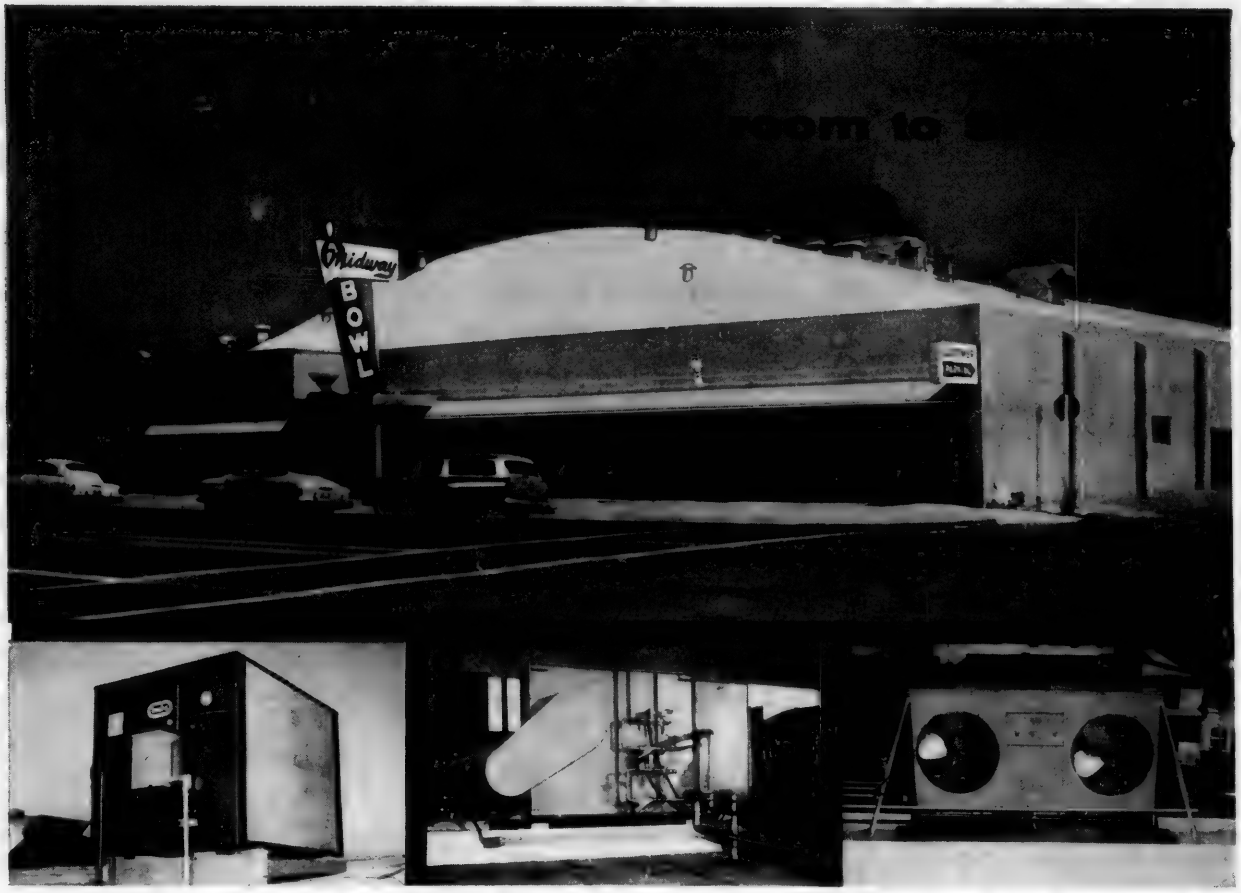
Direct-Lift Solenoid Valve

A full-ported, direct-lift solenoid valve with port sizes from ¼ to 3 inches and capacity from zero to 3,000 psi has been announced by the Atkomatic Valve Co., Indianapolis, Ind. The Series 30,000 valve, available in bronze or stainless steel, features the new Uramic solenoid, said to assure reliable operation regardless of line pressures.



The series was designed to meet the demand for positive operation over the entire range from zero to 3,000 psi. The company manufactures a line of electrically operated valves for air, gas, liquids, and steam.

More information? Circle Item 82, postcard, last page.

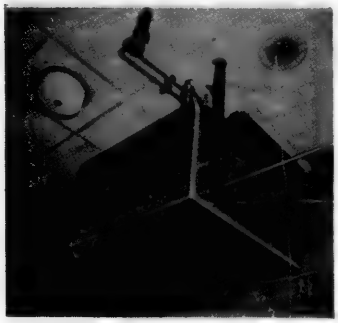


Heat-X 'RCU' Remote Condensing unit (used with 'CC' unit) for coffee shop and offices.

'HAH' Horizontal Air Handling unit (used with 'LRCU') mounted on roof, air conditions bowling area.

'LRCU' Large Remote Condensing Unit (used with 'HAH') serves bowling area.

DUNHAM-BUSH made a comfort STRIKE



'CC' Comfort Conditioner in office area (used with 'RCU').

ROOM AT THE TOP AND COMPACT DUNHAM-BUSH EQUIPMENT ENABLED MIDWAY BOWL TO INCLUDE CUSTOMER COMFORT IN REMODELING PLANS...

In the remodeling plans for Midway Bowl, San Leandro, California, addition of air conditioning for customer comfort was extremely important.

But space limitation in this 160′ x 125′ structure was a serious problem.

The solution was an applied combination of careful engineering and compact Dunham-Bush products. Result . . . the virtually all-roof-top installation of a highly efficient system.

Widely known for its broad heating and cooling service to large industrial and commercial buildings, Dunham-Bush also satisfactorily serves the smaller ones through 'one source—one responsibility' operation. The challenging circumstances under which Dunham-Bush products were specified and installed here at Midway may be right up your alley on your next job. Call the Dunham-Bush sales engineer near you for more information.

Dunham-Bush, Inc.

WEST HARTFORD 10 • CONNECTICUT • U. S. A.

DUNHAM-BUSH

AIR CONDITIONING • REFRIGERATION • HEATING • HEAT TRANSFER

WEST HARTFORD, CONNECTICUT • MICHIGAN CITY, INDIANA
MARSHALLTOWN, IOWA • RIVERSIDE, CALIFORNIA

SUBSIDIARIES

heat x

Advantages of Constant Volume Regulators in High Velocity Air Transmission

. . . greater design flexibility, stable air delivery, self-balancing operation of branch ducts are typical benefits

The function of a constant volume regulator is twofold:

1. To reduce high velocity air to conventional velocities;
2. To deliver a constant cfm flow as supply duct pressures change.

Constant volume regulators provide automatic compensation for static pressure variation, and assure balanced system performance under a wide range of operating conditions.

Barber-Colman now makes available a line of standard constant volume regulators and control units to meet nearly every application.

Model SCR Regulator

The completely self-contained, self-operated Barber-Colman constant volume regulator, illustrated in Fig. 1, has proved to be a highly accurate and reliable device. It can be installed anywhere in a single- or double-duct system to maintain constant cfm delivery, regardless of pressure changes upstream or downstream, including those caused by operation of mixing valves or face and bypass dampers.

As illustrated, a flexible diaphragm is actuated by changes in static pressure to control the area of the discharge opening. No separate power source is required. The regulator will operate on as little as 0.5 inches of static pressure in the duct.

Both static and velocity pressure exist under the flexible diaphragm where the air can pass through the discharge plate. Static pressure exists only above the diaphragm where the air is trapped. A static pressure increase above the diaphragm forces it downward against spring pressure, limiting the open area. Conversely, when static pressure decreases, the diaphragm raises, exposing a larger opening area.

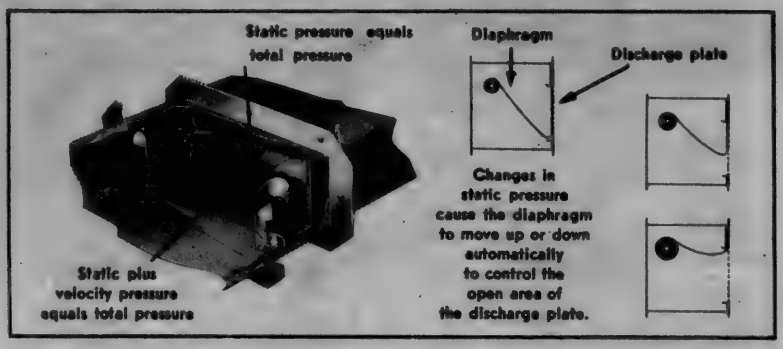

Static pressure equals total pressure
Diaphragm
Discharge plate
Changes in static pressure cause the diaphragm to move up or down automatically to control the open area of the discharge plate.
Static plus velocity pressure equals total pressure

Fig. 1 — Model SCR constant volume regulator can be installed anywhere in a duct system where there are changes in static pressure. It maintains cfm delivery within ±5% for inlet air pressure differences as high as 6 to 1.

The spring tension of the diaphragm roller is set at the factory to meet job requirements, but it can be easily adjusted in the field should requirements change.

Double-Duct Control Units

Three basic types of Barber-Colman double-duct control units combine the basic constant volume regulator with hot and cold air mixing valves. The two valves are controlled by a single motor operator as illustrated in Fig. 2. The housing is acoustically lined to assure very low noise levels.

Standard units meet above-the-ceiling, under-window, or sidewall installation requirements in the vast majority of cases. Modified units are available for unusual situations.

Figs. 3 through 7 illustrate typical applications and the design flexibility of these regulators and control units.

New High Velocity Manual

A new 52-page manual has been developed by Barber-Colman to provide engineers a handy reference source to high velocity design considerations. In addition to a general discussion, it includes data on duct design, air requirements, return air systems, fan selections, temperature control, balancing procedures, and Barber-Colman control units.

Ask for Catalog No. F-6598-1. Call your local Barber-Colman air distribution field office or write.

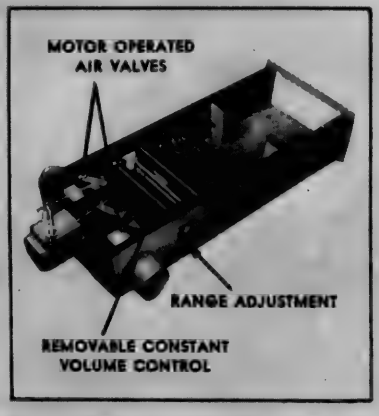


Fig. 2 — Model CV double-duct control unit combines mixing valves with a constant volume regulator.

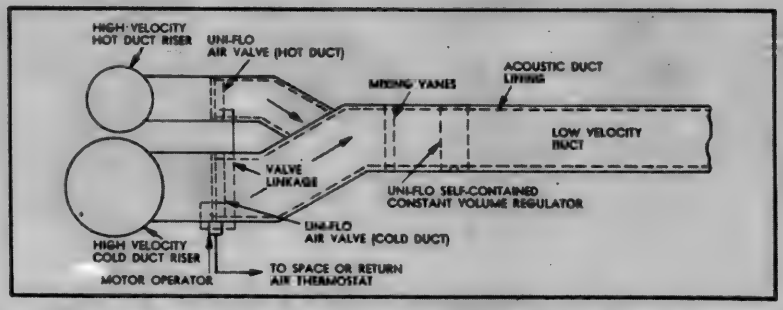


Fig. 3 — Double-duct system with motor-operated air valves for hot and cold air mixing and a model SCR regulator to provide constant cfm delivery to the low velocity duct. A Model CV unit (Fig. 2) could be used instead of the two valves and the single SCR regulator.

Instead of a single SCR regulator, individual ones can be installed in branch ducts. In this case, the low velocity duct system would be self-balancing.

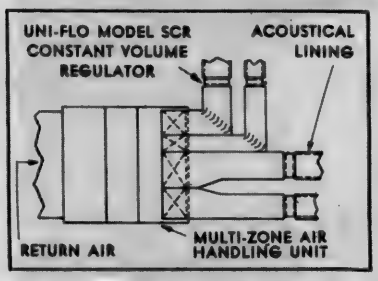


Fig. 4 — Multizone system with SCR regulators in each zone to provide constant cfm delivery.

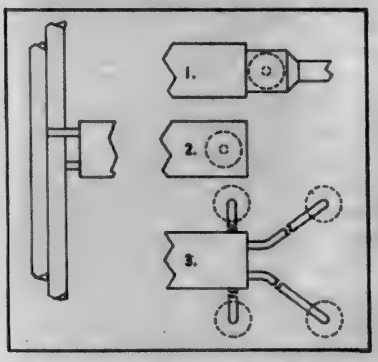


Fig. 5 — Double-duct system illustrating several applications of Model CV control units. Circles indicate ceiling diffusers. (1. CVE open-end unit; 2. CVD with integral diffuser; 3. CVO with octopus outlets.)

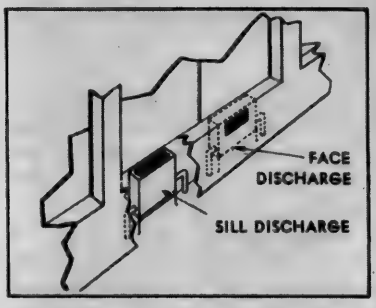


Fig. 6 — Double-duct control unit for under-window mounting. Model SWC furred-in units shown.

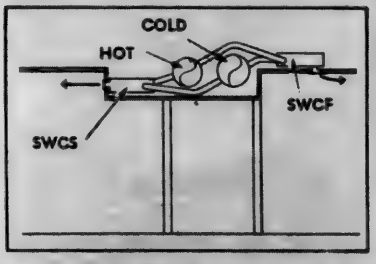


Fig. 7 — Model SWC double-duct control units installed above ceiling for use with ceiling and sidewall diffusers.

BARBER COLMAN
Uni-Flo
ENGINEERED
AIR DISTRIBUTION
BARBER-COLMAN COMPANY
Dept. X, 1102 Rock Street, Rockford, Illinois

PLUMBERS COMPETE

(Concluded from page 12)

installation costs, resulting from the speed and ease with which copper can be installed. As a result, the exact savings in many parts of the country depend upon these installation costs. And in those areas where building and plumbing codes do not allow use of the new copper drainage tube, DWV, the contractor or builder may find that the cost of the unnecessary heavier-walled copper tube will eat into his dollar saving that results from quicker installation.

SEVEN BROADWAY THEATERS TO BE CENTRALLY COOLED

Seven historic theaters, representing nearly one quarter of New York's entire Broadway legitimate theater district, will be mechanically air conditioned for the first time by next summer, it was announced by theater owner J. J. Shubert and Worthington Corporation, makers of the air-conditioning equipment. All seven theaters will be linked to a master air conditioning system, which will be located, out of sight, under famed Shubert Alley.

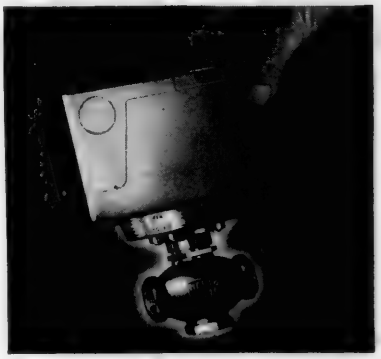
The theaters, whose 7,999 seats make this installation the largest single theatrical air conditioning installation ever devised, will continue in operation while the installation is going on, with the new system due to be turned on by next spring.

The new system replaces ice-chilling systems where up to $6,000 worth of ice a week, in 350-lb chunks, has been required to cool the seven theaters during hot weather. The new system will cost one-tenth as much to operate, according to Worthington engineers.

Though the ice system was outmoded, most theaters were closed during the summer and so it was not practical to install mechanical cooling. The Mark Hellinger Theater, which installed air conditioning five years ago, was one of the first legitimate theaters in New York with mechanical cooling. Two factors have changed the theater into a year round business and made provisions for the summer comfort of patrons a must: first, the growth of mail order advance sales, and second, the growth of theater parties.

NOW...

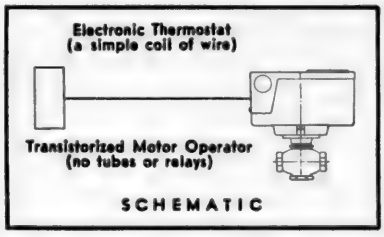
Electronic Control at no extra cost!



...new transistorized motor operator for proportional control!

The transistor operator is an electronically controlled device containing a transistorized amplifier and an operating mechanism for proportional operation of a valve (as shown) or damper.

Virtually self-contained, the attachment of a two-wire sensing element forms a complete elec-



tronic control system (see schematic). Wide choice of sensing elements.

Compactness, simplicity, and moderate cost are achieved through the use of transistors and electronic circuitry. This means superior performance and low maintenance.

Spring-return action provides fail-safe performance.

Ask for Brochure F8991

BARBER COLMAN **Automatic Controls**

"Better Control... Electrically"

BARBER-COLMAN COMPANY
Dept. X, 1302 Rock Street, Rockford, Illinois
Field Offices in Principal Cities

"Chicago"

the new "IMMERSIPUMP"* SUBMERSIBLE NON-CLOG SEWAGE and SUMP PUMP

*Trademark

- **Low Original Cost**
- **Low Maintenance Cost**
- **Easy To Install**
- **Easy To Service**
- **Pump And Motor Operate Completely Submerged**

FOR Pumping Sewage And Other Liquids Containing Solids . . . and Sump Pump Applications

The new "Chicago" IMMERSIPUMP* is a development of 50 years of experience in the research, engineering and manufacture of sewage and sump pumps for buildings, industrial plants and municipalities.

The finest materials are used . . . to assure years of trouble-free service. No superstructures are required for outdoor installations . . . minimum head room is required for indoor installations. The Stainless Steel Bail enables easy installation and removal of the unit. The enclosed Non-Clog pump impeller passes solids up to 2½". The pump casing is made of close-grained, cast iron . . . the shaft of Stainless Steel. A separate Suction Plate, with tripod, is furnished to support the entire unit . . . enabling easy, quick access to the Impeller.

The Motor is specially designed for submersible operation . . . being totally-enclosed and oil filled to positively assure against water entering the unit.

. . . *available with the new* SEALTRODE* Sealed Electrode Floatless Pump Controller . . . the *only* Controller featuring completely sealed Electrodes . . . positively preventing insulation or coating by grease or other corrosive elements.

"Chicago" Distributors are located in most principal cities. See the one nearest you today for full details.

1959 50 YEARS CHICAGO PUMP COMPANY 1909

Putting Ideas to Work

FOOD MACHINERY AND CHEMICAL CORPORATION

Chicago Pump Company

6222 DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

© 1959—CPCo.-FMC

BRIEFLY STATED

NEWS ITEMS

"What is the most unusual ventilating application you have ever seen or heard about?" and "What unusual ventilation application would you like to see attempted?" were questions recently asked of industrial ventilating equipment buyers in a contest sponsored by ILG ELECTRIC VENTILATING CO., Chicago, Ill. Thirty portable television sets were awarded to winners from all parts of the country. Judges were E. C. Kubecek, director of alumni relations and placement, Illinois Institute of Technology; John Maras, chief mechanical engineer, Graham, Anderson, Probst and White, Inc.; and Robert Salinger, chief mechanical engineer, Naess & Murphy.

Some of the answers received included: keeping fog off low places on highways by using ventilating fans; using fan air as an air door on the loading dock of a food plant to repel insects; using ventilating fans to segregate foreign matter, pine needles, etc., from cocoons of spruce worms in hibernation. Listed in the answers of applications which contestants would like to see tried were: hot air removal from parked cars in summer; portable fans built like pocket radios; underground exhaust systems at traffic intersections to capture automobile exhaust gases. . .

* * *

BALTIMORE AIRCOIL CO., INC., Baltimore, Md., held open house for ASHRAE's Regional III meeting on October 21. One hundred fifty members were given an hour-long guided tour of the manufacturing facilities. Among the guests were Arthur Hess, ASHRAE president; Mrs. Hess; D. D. Wile, first vice-president; and Cecil Boling, past president of the Society.

(Continued on page 126)

how the *Peer* is put in *Peerless Electric*®

• Heavy, rugged-duty wheels in Peerless Electric air moving equipment are completely arc welded into one homogeneous whole. No rattles or vibration from these wheels! Precision-cut, heavy-gauge steel. Assembled and welded in jigs, producing a uniform wheel size—size after size.

WRITE TODAY FOR CATALOGS!

PEERLESS ELECTRIC DIVISION PORTER **H. K. PORTER CO., INC.**

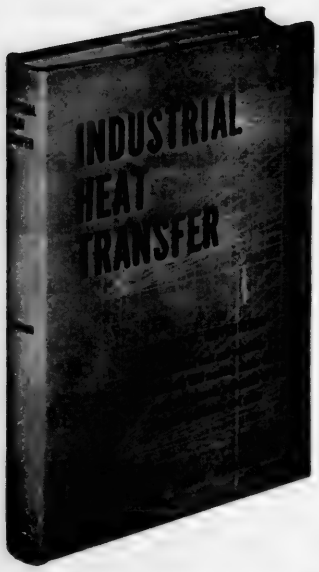
W. MARKET ST. • WARREN, OHIO

PORTER SERVES INDUSTRY: with Rubber and Friction Products—THERMOID DIVISION; Electrical Equipment—DELTA-STAR ELECTRIC DIVISION, NATIONAL ELECTRIC DIVISION, PEERLESS ELECTRIC DIVISION; Specialty Alloys—RIVERSIDE-ALLOY METAL DIVISION; Refractories—REFRACTORIES DIVISION; Electric Furnace Steel—CONNORS STEEL DIVISION, VULCAN-KIDD STEEL DIVISION; Fabricated Products—DISSTON DIVISION, FORGE AND FITTINGS DIVISION, LESCHEN WIRE ROPE DIVISION, MOULDINGS DIVISION, H. K. PORTER COMPANY de MEXICO, S.A.; and in Canada, Refractories, "Disston" Tools, "Federal" Wire and Cable, "Nepcoduct" systems—H. K. PORTER COMPANY (CANADA) LTD.

Also Manufacturing The Massachusetts Line®

Member of the Air Moving and Conditioning Association, Inc. (AMCA)

SEE OUR CATALOG IN SWEET'S



Solve Heat Transfer Problems Directly and Accurately!

INDUSTRIAL HEAT TRANSFER by F. W. Hutchinson, presents 123 working graphs that permit the direct solution of complex problems of heat transfer. Use of these graphs — which are equal in accuracy to the equations from which they are derived — speeds heat transfer analysis and helps to eliminate errors in calculation. In addition to the complete text, graphs are provided for: air, acetylene, ammonia, benzene, chlorine, ethane, ether, helium, oxygen, pentane, steam, sulphur dioxide, water, and 57 other industrially used liquids and gases.

Get your copy of this valuable working reference book today!

336 Pages, 136 Charts and Illustrations — $7.00

ORDER YOUR COPY TODAY!

THE INDUSTRIAL PRESS, 93 Worth St., New York 13, N. Y.

Please send me a copy of INDUSTRIAL HEAT TRANSFER at $7.00.

☐ I enclose payment in full. Send book postpaid. Foreign orders—except from Canada—must be accompanied by payment in full including 50c postage charges.

☐ Bill me ☐ Bill company. (Postage charges will be added)

NAME .....

COMPANY .....

CITY ..... ZONE .... STATE .....

HOME ADDRESS .....

(Please fill in if you want book sent to your home) ACHV/12/59

Briefly Stated

(Continued from page 124)

WITH THE ENGINEERS

Appointment of Dr. Stanley F. Gilman as manager of compressor development for the UNITARY EQUIPMENT DIV., CARRIER CORPORATION, Syracuse, N. Y., was announced. Formerly associate director of research in the Research & Development Division, Dr. Gilman joined Carrier in 1953 from the University of Illinois, where he was assistant professor of mechanical engineering. . .

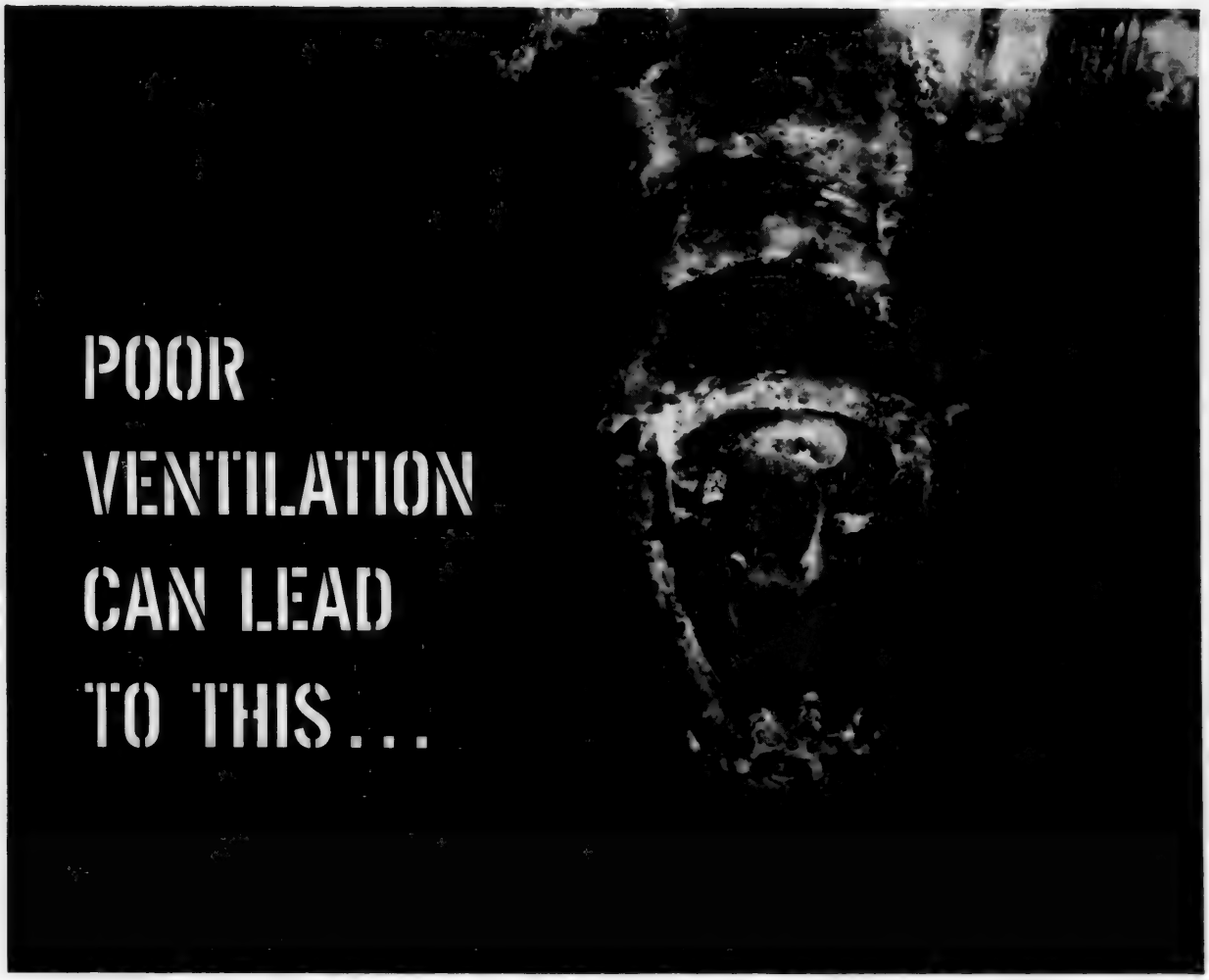
Henry H. George has been appointed chief engineer, product engineering and research department, TUBE TURNS DIVISION OF CHEMETRON CORP., Louisville, Ky. He joined Tube Turns as manager of research in 1944, and is a member of ASME, American Institute of Physics, the Kentucky Society for Professional Engineers, and the Society of Experimental Stress Analysis. . .

Jack L. Campau, former assistant development engineer with American Blower, has joined the faculty of the mechanical engineering department at the UNIVERSITY OF DETROIT. Mr. Campau, 36, holds bachelor and masters degrees in mechanical engineering from Wayne State University. . .

John W. Nevins has been appointed chief engineer of BROWN FINTUBE CO., Elyria, Ohio. Mr. Nevins was formerly chief draftsman of the company and has been associated with the company since 1942. In his new position he will be in charge of engineering on modular heat exchangers, tank heaters, suction and line heaters, indirect fired heaters, interstage compressor coolers, process heaters, and coolers. . .

Norman B. Champ, Jr., vice-president of MIDWEST PIPING CO., INC., St. Louis, Mo., has been elected to the board of directors of the company to succeed Guy L. Morrill, retired. A graduate of MIT in me-

(Continued on page 128)



Hartzell ventilation can help prevent it

One plant which had been replacing corroded sprinkler system heads every two months now reports eight months without a change since a Hartzell fiberglass duct fan was installed to exhaust acid fumes from over a row of plating tanks. And that's a typical example of how a small investment in effective ventilation can produce tremendous savings on plant maintenance costs and on replacement of expensive fixtures and equipment. Even very mild concentrations of corrosive elements can cause extensive damage if you don't keep them under control.

There's no stock answer to the problem of controlling corrosive fumes, but effective ventilation is a part of every complete solution. Standard exhaust fans or roof ventilators may be adequate for one job . . . the next may require special equipment such as Hartzell's new all-fiberglass duct fans.

Whether you're concerned with the operation of an existing plant or the design of a new one, Hartzell has the fan or blower that's exactly right to help you keep corrosive fumes under control. Your nearby Hartzell representative will be happy to supply complete information and recommendations. If you don't know him, just drop us a line for his name and address or check the Hartzell catalog in Sweet's Plant Engineering or Industrial Construction File.

here's a complete line of air moving equipment designed and built specifically for industry

Other famous Hartzell products include controllable and full feathering propellers for light aircraft, crop drying equipment and farm ventilating fans.

HARTZELL PROPELLER FAN COMPANY • 55 Thomas Blvd. Piqua, Ohio
Div. of Castle Hills Corp. A Member of AMCA Engineering Offices in Principal Cities

for FUME

CONTROL

install

FLEXAUST®

HOSE

Made of strong neoprene coated cotton or nylon fabrics spiral wire reinforced.
For *all* kinds of fume and dust control, and ventilation uses.
Extremely flexible, durable, and lightweight.
Exceptionally easy to cut, install, connect, reuse, and relocate.
Sizes 1¼" thru 36" i.d.

Write for details today
Distributors in all principal cities

THE FLEXAUST COMPANY
Dept. HV-12
200 PARK AVE., NEW YORK 17, N. Y.

Briefly Stated

(Concluded from page 126)

chanical engineering, he also holds a master's degree from the Harvard Graduate School of Business Administration. . .

LIMBACH COMPANY, mechanical and metals contractors, Pittsburgh, Pa., announces the promotion of James F. Sasser to staff manager of the Mechanical Division, and chief engineer. He will be succeeded by Alan Marcus as manager of the Mechanical Department in Pittsburgh. A professional engineer, Mr. Sasser entered the air conditioning and mechanical construction industry immediately after graduation at Purdue University as a mechanical and electrical engineer. His duties will include extension of Pittsburgh mechanical contracting operations to company plants in Columbus and Cincinnati, Ohio. Prior to his present appointment, Mr. Marcus served as division estimating manager. He joined Limbach Company in 1945 upon completing his engineering work at the University of Pittsburgh. . .

Earl L. Bedard, former district manager for a prominent combustion control manufacturer, has joined the engineering staff of the Heating Equipment division of IRON FIREMAN MFG. CO., Cleveland, Ohio. Mr. Bedard has an extensive background in all phases of heating and combustion controls. He was also previously with the research and development engineering department of another leading control producer, attended the University of Minnesota, and holds memberships in the Detroit and Cleveland Engineering Societies, and Master's card #74, Heating Ventilating and Air Conditioning, City of Minneapolis.

PERMUTATIONS - COMBINATIONS

MIDLAND-ROSS CORPORATION acquired SURFACE COMBUSTION CORPORATION, producer of industrial furnaces and heating equipment. Midland-Ross was formed in December, 1957, with the merger of Midland Steel Products Co., Cleve-

new...

THE Dwyer

Filter Gage

tells exactly when to change filters . . .
lasts indefinitely . . .
fits all furnace and air conditioning units . . .

one hole, 60 second installation

Individually packaged with display/merchandising counter sales carton. A foolproof filter gage that really works sold on a satisfaction or money-back guarantee. Write for free sample and discounts.

F. W. DWYER MFG. CO.

P. O. BOX 373-N
MICHIGAN CITY, INDIANA

land, Ohio, and J. O. Ross Engineering Corp., New York, N.Y. Surface Combustion has its headquarters in Toledo and Columbus, Ohio. . .

All of the stock of REPUBLIC APPLIANCE CORPORATION will be sold to TRANS CONTINENTAL INDUSTRIES, INC., in exchange for a controlling block of stock in Trans Continental, it was announced. Republic will be an operation division of Trans Continental and will continue to be a leading producer of water heaters. It has plants in Erie, Pa., Los Angeles, Calif., Portland, Ore., and Chicago, Ill., will break ground shortly for a new facility in Dallas, Tex.; and is negotiating for the purchase of another hot water heater company in the South. . .

Shareowners of WESTERN PRECIPITATION CORP., Los Angeles, Calif., approved acquisition of the assets of Western by JOY MFG. CO., Pittsburgh, Pa. Western is a leading supplier of electrical precipitator, filter, wet scrubber and mechanical types of dust collecting equipment; and also heat-exchange equipment for material processing. Joy, producer of underground mining equipment, also manufactures construction machinery, compressors, fans, oil field tools, electrical specialties, and wet inertial dust collectors. Western Precipitation will be operated under that name as a division of Joy. . .

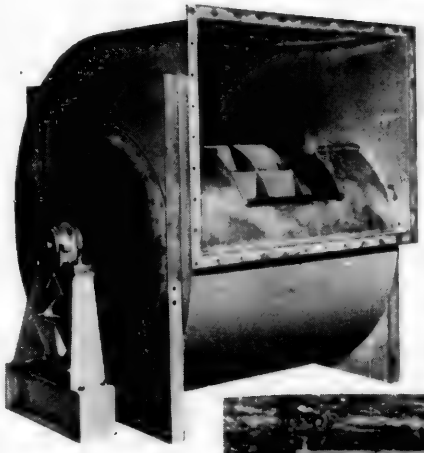
WALWORTH CO., New York, N.Y., has concluded an exclusive licensing arrangement with CANADA IRON FOUNDRIES, LTD., Montreal, for the manufacture and sale in Canada of the Walworth industrial line of valves. . .

NEW REPRESENTATIVES

A. R. Bowman Co., Rochester, N.Y., has been appointed a heating and air conditioning sales representative for that territory for MCQUAY, INC., Minneapolis, Minn. . .

J. D. Wilson Company, Inc., Milwaukee, Wis., has been franchised as a distributor for the products of CARRIER CORPORATION in three addi-

In Pittsburgh's new Fort Pitt Tunnel, Bayley fans were chosen for ventilation



Here is the Bayley Type AP Series 4 Fan

Bayley fans were chosen for placement at both ends of the new Fort Pitt Tunnel.

Why Bayley? The engineers might have considered the 35 years of trouble-free service delivered by Bayley fans in the Liberty Tunnel in Allegheny County.

There are ten Bayley Type AP Series 4 fans to be installed in the Fort Pitt Tunnel.

Here is the new Fort Pitt Tunnel

Four Bayley Type AP Series 4, DW-DI, 108¾" wheel diameter fans to be installed at each end of the tunnel.

ONE END: Four fans—326,600 CFM, each at 3.0" S.P., 294 RPM, Motors 200 HP, chain drive.

OTHER END: Four fans—264,500 CFM, each at 1.99" S.P., 239 RPM, Motors 100 HP, chain drive.

ONE TUNNEL EXHAUST FAN AT EACH END on Emergency Standby—DW-DI, 98¼" wheel diameter, 300,000 CFM, each at 1.5" S.P., 320 RPM, Motors 150 HP, direct drive.

When you want a job well done, it's good sense to call Green.

Green-Bayley BLOWER DIVISION

THE GREEN FUEL ECONOMIZER CO., INC.

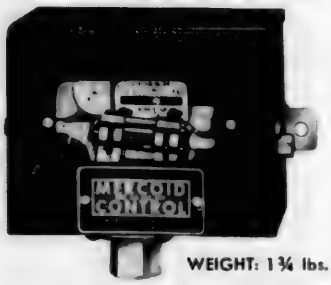
BEACON 3, NEW YORK

NEW

Small, Lightweight

MERCOID PRESSURE CONTROL

AP-153



WEIGHT: 1¾ lbs.

FOR MEDIUMS NOT INJURIOUS TO STEEL OR SILVER SOLDER

CIRCUIT

SP-DT HERMETICALLY SEALED MERCURY SWITCH (4A. 115V., 2A. 230V.)

Provides any of following operations:

1. *Single Pole—Cut-in high (close on rise)*
2. *Single Pole—Cut-in low (open on rise)*
3. *Single Pole—Double Throw*

OPERATING RANGE

Adjustable Operating Range	Differential Fixed (Factory Set)	Maximum Surge Limits
1 to 20 psig	0.5 psig.	30 psig.

CONSTRUCTION

ADJUSTMENT: External
PRESSURE ELEMENT: Fairprene diaphragm
PRESSURE CONNECTION: ¼" I.P.S.
MOUNTING: Has two mounting ears (one on each side of control) or control may be pipe mounted by means of the ¼" I.P.S. bottom connection.
INTERNAL WIRING CONNECTIONS: 3 post terminal block.
CASE: NEMA 1—Heavy gauge steel, cadmium plated. Steel cover (with glass front) finished in charcoal-gray.

WRITE FOR BULLETIN 02

THE MERCOID CORPORATION
4201 Belmont Ave., Chicago 41, Ill

Briefly Stated

tional trading areas in Wisconsin, centering around Madison, Stevens Point and Wausau. The firm will sell to dealers the full line of air conditioning equipment produced by the company's Unitary Equipment Division.

BURGEONING BUSINESS

EMERSON ELECTRIC MFG. CO., St. Louis, Mo., has embarked upon an intensive electric heat program which includes research, development, engineering, and production of a complete line of electric heating. The object is to participate in the extensive home building and remodeling requirements predicted to take place within the next two decades. The company expects its electric heating to become the most important of its building line. . .

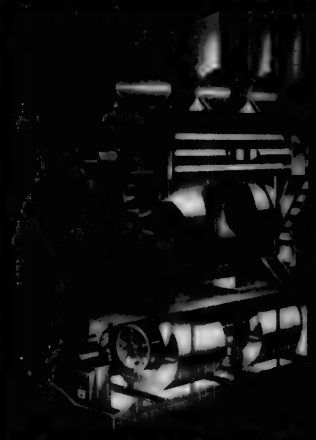
Ground will be broken early in 1960 for a 150,000 sq ft general office building of WEIRTON STEEL COMPANY, division of National Steel Corporation, at Weirton, W. Va. It will house all staff and administrative departments of the company. A 375-acre tract of land had been purchased for the office building and the National Steel Research Center. In addition to office space, the new building will have complete dining facilities for employees. . .

THE TRANE COMPANY, La Crosse, Wis., announced plans for a million-dollar plant in Salt Lake City, Utah, to better serve its Western markets. Construction will start on an 86-acre site in the very near future. The plant will be about 60,000 sq ft plus warehouse facilities and should be in operation within about a year. Deseret Architects and Engineers, Salt Lake City, are designing the new factory. . .

WESTINGHOUSE ELECTRIC CORP., Pittsburgh, Pa., will build a centralized research and development center in the Pittsburgh, Pa., metropolitan area. The center will bring together on a single site in Churchill Borough, ten miles from downtown Pittsburgh, all the key personnel associated with basic and applied research. Ground will be broken early in 1960 for two new

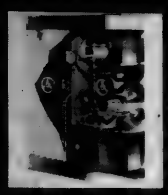
LENNOX

"OG" SERIES INDUSTRIAL HEATER



Remarkable Adaptability

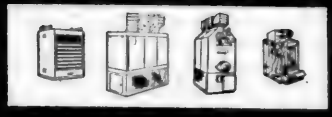
Efficient heat transfer design results in reduced physical size of this heater . . . allowing it to take up a minimum of space. If floor space is at a premium, the "OG" can be suspended horizontally or inverted. Removable nozzles permit free standing ducted installations.



DUAL FUEL Power Burners

Burner operates equally well with either gas or oil. Changeover is instant and automatic.

LENNOX "Task-Matched" Equipment to control and condition air for industry



64,000 to 2,000,000 Btuh

CLIP AND MAIL FOR FREE SPEC SHEETS

LENNOX Industries Inc.
INDUSTRIAL DIVISION
P.O. Box 1294, Dept. AC-12
Des Moines 5, Ia.

Please send me—without obligation—complete specifications and engineering data on Lennox "OG" Series Industrial Heaters

Name.....
Company.....
Address.....City.....
Title.....

buildings to be constructed on the 100-acre site now occupied by the Westinghouse research laboratories. Full occupancy of the facilities is scheduled for 1961. . .

THE LOUIS ALLIS CO., Milwaukee, Wis., manufacturer of motors, generators and adjustable speed drives, announced construction of a research and development center in the neighboring suburb of Greendale to be staffed by one hundred engineers and technicians, doubling the size of the present engineering and physics laboratories. . .

HALSTEAD & MITCHELL, Pittsburgh, Pa., has broken ground at Zelienople, Pa., for a new plant which will permit a 150% increase in output. The plant will be operated by the company's Herbie-Duke Division and is intended to be the most modern plant in the industry. A windowless structure, it will be completely air conditioned, with lighting of 40 foot-candles throughout the plant.

PEOPLE IN MANUFACTURING

Announcement is made by AIR FILTER CORP., Milwaukee, Wis., of the appointment of William Welty as vice-president in charge of sales. Mr. Welty comes to Air Filter with over sixteen years of experience in the air filter and electronic engineering field. A graduate engineer, Mr. Welty also designed and originated several products in the railroad field. As a sales and service engineer, he has worked with all branches of the government armed forces on special filters for the electronic field. Plans now are to expand Air Filter's sales and production in both the electronic and railroad fields. Also appointed by Air Filter is Miss Selma Voss, who was made Secretary of the organization on August 1st. . .

L. E. Daniel is appointed manager, Jobber Sales Department, The Trane Co., La Crosse, Wis. In his new position, Mr. Daniel will coordinate sales of Trane heating products through heating and plumbing wholesalers. Formerly

NEW

Burt Spun Aluminum

Direct and V-Belt Drive Centriflow Fan Ventilators

For institutions and other structures where a high capacity, low contour ventilator is required.

direct drive spun units

V-belt drive spun units

- 25 BASIC selections of tip speeds and capacities in direct drive models.
- 64 BASIC selections of tip speeds and capacities in V-belt drive models.
- CAPACITIES from 65 to 27,648 CFM.
- HORSEPOWER ratings from 1/60 to 7½.
- SIZES from 6" through 48" wheel diameters.
- STATIC PRESSURE range from 0" through 1" W.G. (higher static pressures on application).
- LOW PROFILE heavy gauge spun aluminum housings.
- NON-OVERLOADING backward curved, non-sparking aluminum fan wheels.
- ADJUSTABLE SHEAVES on V-belt units to change capacities at anytime.
- DAMPERS available in drop-in sleeve type, automatic back-draft or motor operated.
- BURT DESIGNED for minimum noise levels.
- AMCA CERTIFIED capacity ratings for units of 16" wheel diameter and larger.

Send for FREE Data Book!

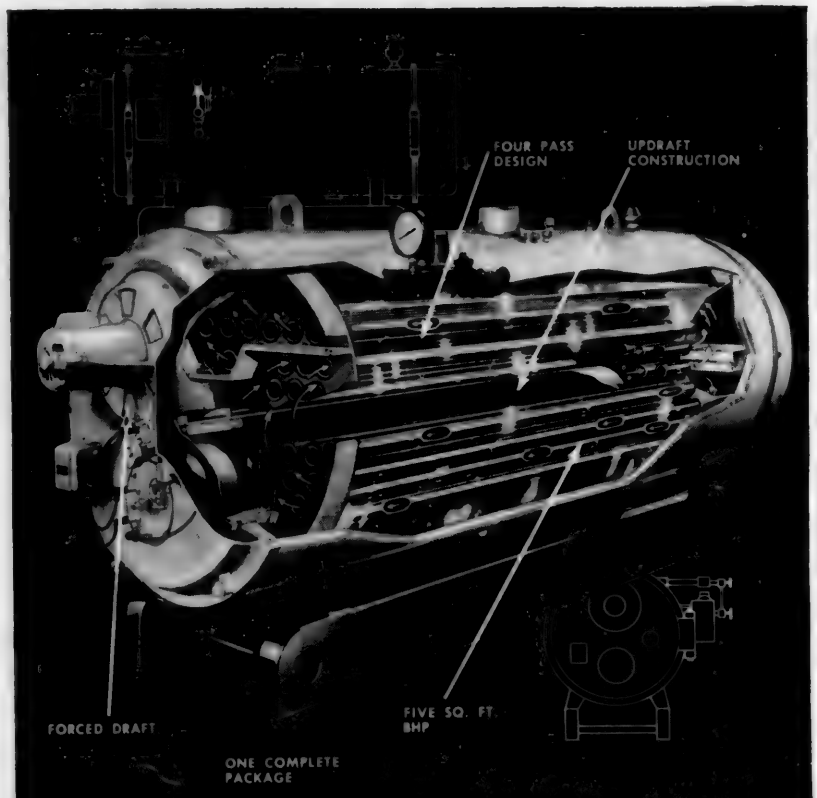
Write for Burt Data Book SPV-101-H.
It supplies quick data on Burt's complete line of modern Roof Ventilators.

FAN & GRAVITY VENTILATORS • LOUVERS • SHEET METAL SPECIALTIES

The Burt Manufacturing Company

49 E. South St. Akron 11, Ohio

MEMBER AIR MOVING & CONDITIONING ASSOCIATION, INC.



Advanced design for heating

Cleaver-Brooks Progress boilers with integrated packaged design pay big dividends in economical production of steam or hot water.

Here's a boiler that was designed expressly for efficient, lower cost commercial heating by engineers who've made progress their specialty. Progress packaged boiler offers advantages for boiler owners never before available in commercial heating applications . . . advantages tailored in a wide range of sizes for schools, apartments, hospitals and small and medium industrial plants.

Cleaver-Brooks packaged design makes the big difference. Progress boiler is factory assembled and then performance tested . . . delivered ready to operate. Nothing to adjust. For example, controls are prewired and checked; you simply bring in the power source. Thus Progress boiler is unusually easy to install . . . producing greater profits for you.

Progress boiler is built to the high standards of large industrial boilers. Four pass design develops high operating efficiency — a guaranteed minimum of 80%. Progress boiler requires no expensive chimney, either. Forced draft design provides all air for combustion in just the right quantity for high combustion efficiency. The Progress boiler burns clean . . . operates for months without cleaning. And Cleaver-Brooks backs the Progress package all the way . . . a Cleaver-Brooks service man starts the boiler for you . . . adjusts it on the job site and trains the boiler operator.

Select Progress packaged heating boilers in sizes up to 2,010,000 btu/hr. Designed for oil, gas, or combination firing with quick fuel changeover. For the full story on the Progress boiler design superiority call your nearby Cleaver-Brooks representative. Or write Cleaver-Brooks Company, Dept. P, 315 East Keefe Avenue, Milwaukee 12, Wisconsin.

Cleaver Brooks

Progress

Packaged Heating Boiler

Briefly Stated

manager, Convector Sales Department, he succeeds Harry J. Case, who was recently appointed manager, Trane residential Climate Changer sales.

Peter L. Quattrochi has become sales manager for TACO HEATERS, INCORPORATED, Cranston, R. I. He was formerly manager of customer services. In his new position, he will be responsible for all field sales and service activities. . .

Appointment of Peter A. McLeod as field sales manager of AIR CONDITIONING & REFRIGERATION DIV., WORTHINGTON CORP., Harrison, N. J. is announced. Mr. McLeod has a degree in mechanical engineering from Tulane University and did post-graduate work there in commercial law. . .

Since 1953 an assistant sales manager, Richard E. Nemmers has been promoted to the position of sales manager of WATERLOO REGISTER CO., Waterloo, Iowa. Waterloo makes air diffusion equipment for commercial and industrial applications. . .

Frank K. Platt, Central Region manager for AMERICAN AIR FILTER CO., INC., Louisville, Ky., is promoted to assistant to the manager of the School Air Systems Division. He will have nation-wide responsibilities for the promotion and exploitation of sales of AAF and Herman Nelson products in the educational and institutional building fields. . .

WARREN WEBSTER & CO., INC., Camden, N. J., announced the appointment of Andrew Ward as vice-president of marketing. According to the heating-cooling equipment manufacturer, his appointment reflects the company's marketing growth not only in the heating but the air conditioning field as well. Mr. Ward has chairmanned the ARI Unitary Air Conditioning Section, has been active in past joint IBR-ARI committee work, and is a member of AGA. . .

(Continued on page 134)

As Simple as ABC

A COMPLETE UNIT

LOW RETURN
LOW SPEED
LOW WATER LINE

CAST IRON RECEIVER – for long life!

A RETURN

DISCHARGE B

C ELECTRICAL

A — One return line connection

B — One discharge line connection

C — One electrical connection

The TVC Condensate Pump is a low speed (1750 R.P.M.) pump for long life and trouble free service.

The unit is completely factory assembled for a simple A-B-C installation.

The low return connection and compactness of the unit provides for simple installation in all locations – particularly where space is limited.

DIMENSIONS

Single Unit—Cap. to 6000 sq. ft. E.D.R. 21" Dia. receiver; hgt. of return above floor only 6⅞".

Duplex Unit—Cap. to 10,000 sq. ft. E.D.R. 25½" Dia. receiver; hgt. of return above floor only 7⅜".

Duplex Unit—Cap. to 15,000 sq. ft. E.D.R. 25½" Dia. receiver; hgt. of return above floor only 10½".

Send for Bulletin TVC-300

CAPACITIES FROM 750 TO 15,000 SQ. FT. E.D.R. — PRESSURES TO 40 P.S.I.

weil PUMP COMPANY

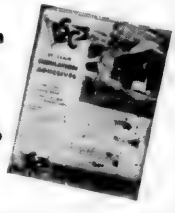
Available from Jobber's Stocks!

1516 N. Fremont St., Chicago 22

30% Savings on Labor Cost
A Permanent Bond
A Better, Neater Job
with
ST. CLAIR
Specially Formulated
INSULATION ADHESIVE

ST. CLAIR Insulation Adhesive specially formulated for bonding insulation material to metal, supersedes pins and clips, wires, screws, and caps. Provides easier, quicker handling. For bonding immediately or up to 45 minutes later.

SC-5000
New Fire Retardant, Blanket Insulation and Lap Seam Adhesive.
Samples on request



ST. CLAIR RUBBER CO.
440 EAST JEFFERSON AVE.
DETROIT 26, MICHIGAN

---

for your convenience / **SPRAY NOZZLES**
and all related accessories for
HUMIDIFYING / *from a single, dependable source*

PRECISION PNEUMATIC ATOMIZING NOZZLES

ACCESSORIES SUCH AS AIR FILTERS, HUMIDISTATS, SOLENOID VALVES, PRESSURE REGULATORS

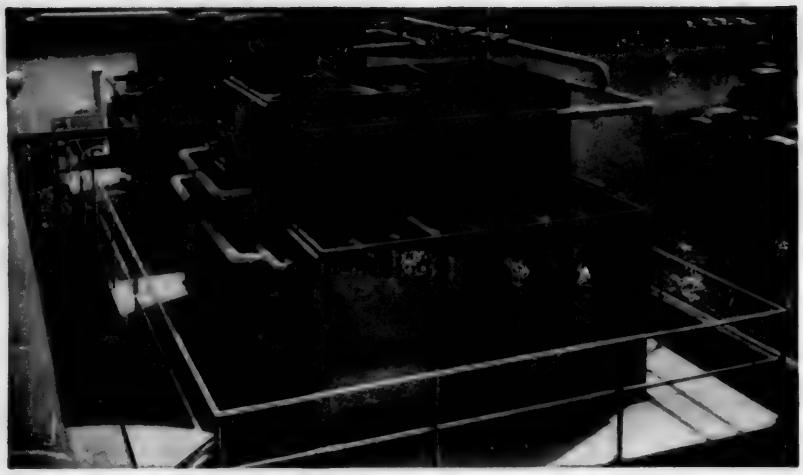
COMPACT HUMIDIFYING UNITS

For industrial installations of every size Spraying Systems offers all needed equipment . . . everything but the piping, wiring and compressor. Provides high efficiency, dependable system; only two components have moving parts. Engineered for easy installation and simplified maintenance.

WRITE FOR Bulletin 82 . . . spray nozzles, assemblies and parts for manual or automatic humidifying systems.

ALSO SUPPLIED . . . spray nozzles for evaporative condensers, air washers, cooling towers, spray ponds and roof cooling systems.

SPRAYING SYSTEMS CO.
3261 RANDOLPH STREET • BELLWOOD, ILLINOIS
ADVANCED SPRAY NOZZLE DESIGN FOR NEW DIMENSIONS IN CONTROL AND PERFORMANCE



MODERN NIAGARA CONDENSERS PAY FOR THEMSELVES IN EXTRA SAVINGS

These Niagara condensers are lower in first cost and assure you of trouble-free automatic refrigeration. Special features: "Aeropass" coil removes super-heat to give you condensing at lower temperatures and prevent loss of capacity by the scaling of condenser tubes; "Oil-out", oil separator between pre-cooling and condensing coils gives you always an oil-free system; "Panel-Casing" construction gives you access to every part of the condenser for inspection and maintenance. Operating engineers say these condensers "save half the work of running a refrigerating plant". Managers who know costs and profits prove that Niagara condensers bring them great returns in power savings, water savings and reduced maintenance expense.

Write for Bulletins 131 and 142.

NIAGARA BLOWER COMPANY
Dept. HV-12, 405 Lexington Ave., New York 17, N. Y.
Niagara District Engineers in Principal Cities of U. S. and Canada

TODD

LOW INSTALLATION AND MAINTENANCE COSTS

. . . plus added years of dependable service

TODD BURNERS
OIL, GAS, OIL-GAS

TODD SHIPYARDS CORPORATION
PRODUCTS DIVISION
SALES AND SERVICE DEPARTMENTS
Columbia & Halleck Streets, Brooklyn 31, N. Y.
PLANT, SALES AND SERVICE
Houston, Texas

Briefly Stated

(Continued from page 132)

WALWORTH COMPANY, New York, N. Y., announced the appointment of Warren G. Parmenter to the position of manager of the firm's Plastics Section. Mr. Parmenter will be responsible for all of development of plastic valves and fittings. He will also assist the manager of plastics sales in having Walworth plastic products included in industrial and municipal specifications and codes. . .

John J. Hayes has been named New York sales manager of L. J. WING MFG. CO., Linden, N. J., manufacturers of air handling and power plant machinery. Mr. Hayes has been with Wing since 1954, as a sales engineer in the New York branch office which he will now head. . .

Realignment of the Packaged Heating and Cooling Department of CHRYSLER AIRTEMP, Dayton, Ohio, to include personnel and responsibilities of the Distribution Department was announced. Packaged Heating and Cooling, which controls all Chrysler Airtemp activities except room units and large applied machinery installations, will be headed by Warren Fitch with the title of manager-marketing. . .

YORK DIVISION OF BORG-WARNER CORPORATION, York, Pa., has announced the appointment of R. J. Halloran and M. S. Lebair as vice presidents of the company. Mr. Halloran, now general manager of the Decatur Works in Decatur, Ill., becomes vice-president York Division, manager—Decatur Works. Mr. Lebair, presently assistant vice-president and assistant director of marketing, becomes vice-president and director of trade relations. . .

James W. Hall has been named southeastern regional sales manager for MODINE MFG. CO., Racine, Wis., manufacturers of heating and air conditioning equipment. Mr. Hall was formerly southeastern regional sales manager for Trion, Inc., manufacturers of electronic air cleaning devices. . .

Briefly Stated

RESEARCH PRODUCTS CORP., Madison, Wis., manufacturers of filters and humidifiers, announced the addition of Glenn A. Olsen to its sales staff. Mr. Olsen has been associated with the company for the past year in the home office in Madison. The appointment became effective on Nov. 1 and he is now serving the territory of Arkansas, Oklahoma, North Texas and Memphis, Tenn. . .

Appointment of Milton E. Morgan as vice-president of A. O. SMITH CORPORATION'S PERMAGLAS DIVISION in Kankakee, Ill., was announced. Mr. Morgan succeeds John H. Brinker, who served in this capacity since 1955. Mr. Brinker has accepted a position with another company. . .

Election of Les Garnsey as secretary of DUNHAM-BUSH, INC., was announced by Cecil Boling, president of the West Hartford, Conn. manufacturing firm. Mr. Garnsey joined Heat-X, Inc., Brewster, N.Y., now a wholly owned subsidiary of Dunham-Bush, in 1947. . .

Appointment of James W. Hosler as general sales manager has been announced by AMERICAN-STANDARD INDUSTRIAL DIVISION, Detroit, Mich. Earlier this year he had been promoted to marketing manager for Kewanee and Nesbitt products. . .

Edward C. Liebrecht, formerly of Detroit, has been named sales manager of SCHEMENAUER MFG. CO., Holland, Ohio. He will direct field sales offices located in principal cities throughout the country. . .

William E. Hoctor has joined the WESTINGHOUSE ELECTRIC CORPORATION'S air conditioning division at Staunton, Va., as manager of manufacturing. He succeeds Burr Tupper, who has become director of works engineering at Westinghouse headquarters in Pittsburgh, Pa. . .

Marion J. Kolasa has been appointed Detroit district manager for the Sturtevant division of Westinghouse Electric Corporation.

See The Newest Equipment at the

2nd Southwest

HEATING & AIR-CONDITIONING EXPOSITION

(under the auspices of ASHRAE)

Dallas, Texas Feb. 1-4, 1960

Memorial Auditorium

IF you're an engineer . . . architect . . . contractor . . . dealer . . . distributor . . . in building management or operation . . . you'll find that a visit to this fact-filled exposition will bring you up-to-date on the latest developments that have been—and will be—affecting your everyday business.

SEE more than 200 informative displays covering recent progress in air handling and treating equipment, as well as refrigeration.

MEET more than 1000 technical representatives of the leading manufacturers in your industry.

DISCUSS with them how their new products can lead to bigger profits for you.

COMPARE and judge at first-hand the relative merits of competitive products.

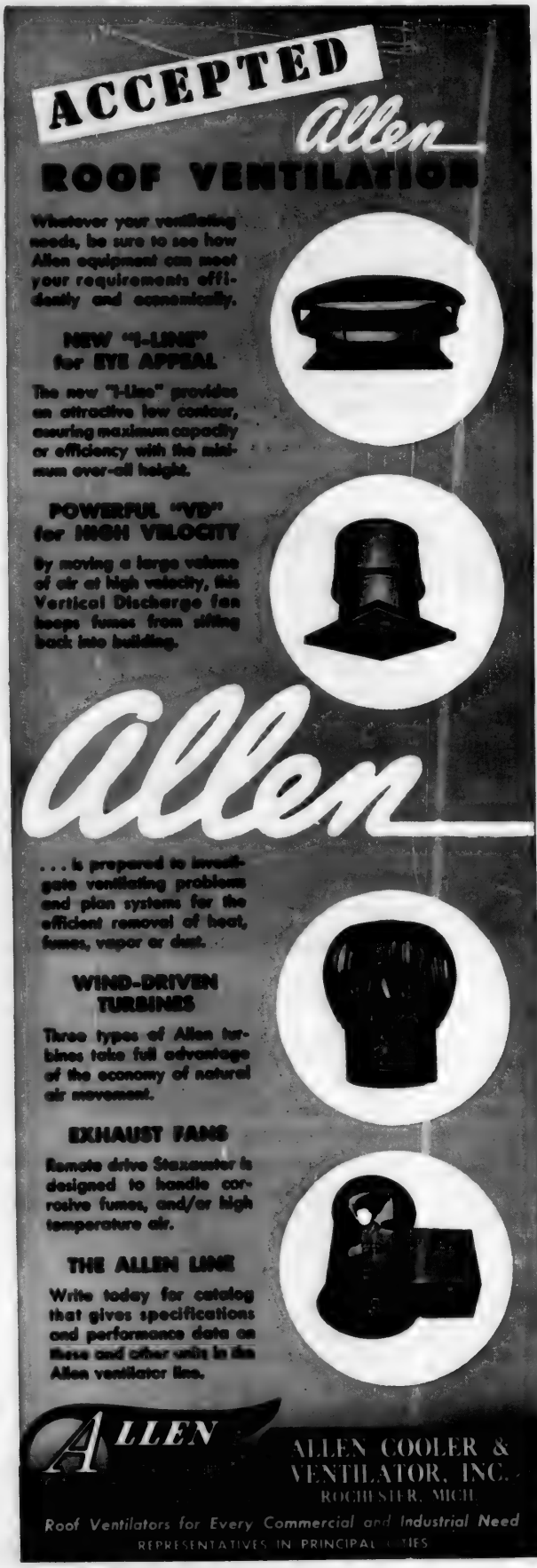
DECIDE which of them can best suit your needs.

2209

2nd Southwest

HEATING & AIR-CONDITIONING EXPOSITION

Management: International Exposition Company, Inc.
480 Lexington Ave., New York 17, N. Y.


ACCEPTED
Allen
ROOF VENTILATION
Whatever your ventilating needs, be sure to see how Allen equipment can meet your requirements efficiently and economically.
NEW "I-LINE" for EYE APPEAL
The new "I-Line" provides an attractive low contour, assuring maximum capacity or efficiency with the minimum over-all height.
POWERFUL "VD" for HIGH VELOCITY
By moving a large volume of air at high velocity, this Vertical Discharge fan keeps fumes from sifting back into building.
Allen
. . . is prepared to investigate ventilating problems and plan systems for the efficient removal of heat, fumes, vapor or dust.
WIND-DRIVEN TURBINES
Three types of Allen turbines take full advantage of the economy of natural air movement.
EXHAUST FANS
Remote drive Staxaustor is designed to handle corrosive fumes, and/or high temperature air.
THE ALLEN LINE
Write today for catalog that gives specifications and performance data on these and other units in the Allen ventilator line.
ALLEN
ALLEN COOLER & VENTILATOR, INC.
ROCHESTER, MICH.
Roof Ventilators for Every Commercial and Industrial Need
REPRESENTATIVES IN PRINCIPAL CITIES

STATEMENT REQUIRED BY THE ACT OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 (Title 39, United States Code, Section 233) SHOWING THE OWNERSHIP, MANAGEMENT, AND CIRCULATION OF "AIR CONDITIONING, HEATING AND VENTILATING" published monthly at East Stroudsburg, Pennsylvania for October 1, 1959.

1. The names and addresses of the publisher, editor, managing editor, and business managers are:
Publisher, The Industrial Press, 93 Worth St., New York 13, N. Y.
Editor, Clifford Strock, 93 Worth Street, New York 13, N. Y.
Managing editor, None.
Business managers, Robert B Luchars, Edgar A. Becker, Harold L. Gray, all of 93 Worth St., New York 13, N. Y.

2. The owner is:
The Industrial Press, 93 Worth St., New York 13, N. Y.; Robert B. Luchars, 93 Worth St., New York 13, N. Y.; Edgar A. Becker, 93 Worth St., New York 13, N. Y.; Harold L. Gray, 93 Worth St., New York 13, N. Y.; Charles O. Herb, 93 Worth St., New York 13, N. Y.; Suno E. Larson, 93 Worth St., New York 13, N. Y.; Walter E Robinson, 93 Worth St., New York 13, N. Y.; Clifford Strock, 93 Worth St., New York 13, N. Y.; Franklin D. Jones, 14 Washington Place E., New York 3, N. Y.; David D. Ketchum, 38 Mill Road, Falmouth, Mass.; Helena E. Oberg, 65 - 82nd Street, Brooklyn 9, N. Y.; John T. Urban, 8 Craigie Circle, Cambridge 38, Mass.; Edgar L. Becker, Nominee for Nancy Jane Becker, Susan Louise Becker and Donald Louis Becker, 714 Wellington Rd., Ridgewood, N. J.; Montclair National Bank & Trust Company and R. B. Luchars, Trustees (Beneficiaries Unknown), Upper Montclair, N. J.; Montclair National Bank & Trust Company and Kenneth D. Ketchum, Trustees (Beneficiaries Unknown), Upper Montclair, N. J.; Lee W. Noyes, Guardian for Susan Yarnall Urban, Greensboro, Vt.; Lee W. Noyes, Trustee U/W of Robert L. Urban, Greensboro, Vt.

3. The known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are:
Dorothy B. Baldwin, 420 Clinton Ave., Brooklyn 38, N. Y.; Franklin D. Jones, 14 Washington Place East, New York 3, N. Y.; Helen L. Ketchum, 231 King St., Cohasset, Mass.; Robert B. Luchars, 93 Worth St., New York 13, N. Y.; Wilbert A. Mitchell, 28 Harlow Road, Springfield, Vt.; Henry V. Oberg, 6825 Almansa St., Coral Gables, Fla.; Ann Pelletier, 116 Pinehurst Ave., New York 33, N. Y.; Elizabeth Y. Urban, 38 Lakeview Road, Asheville, N. C.

4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustees or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

EDGAR A. BECKER, Business Manager
Sworn to and subscribed before me this 17th day of September, 1959.
ALEXANDER LOYKA
Notary Public, State of New York, No. 31-7611350. Qualified in New York County. Commission expires March 30, 1960.

Flow in Sewers

In the September 1959 Reference Data Sheet on calculating flow in sewers there appears the following: "Slope is the length of conduit divided by loss in elevation, or 520/2.70 = 0.0052 ft per ft." This should have been "Slope is the loss in elevation divided by the length of conduit, or 2.70/520 = 0.0052 ft per ft."

WHAT READERS SAY

Condensation and Fog

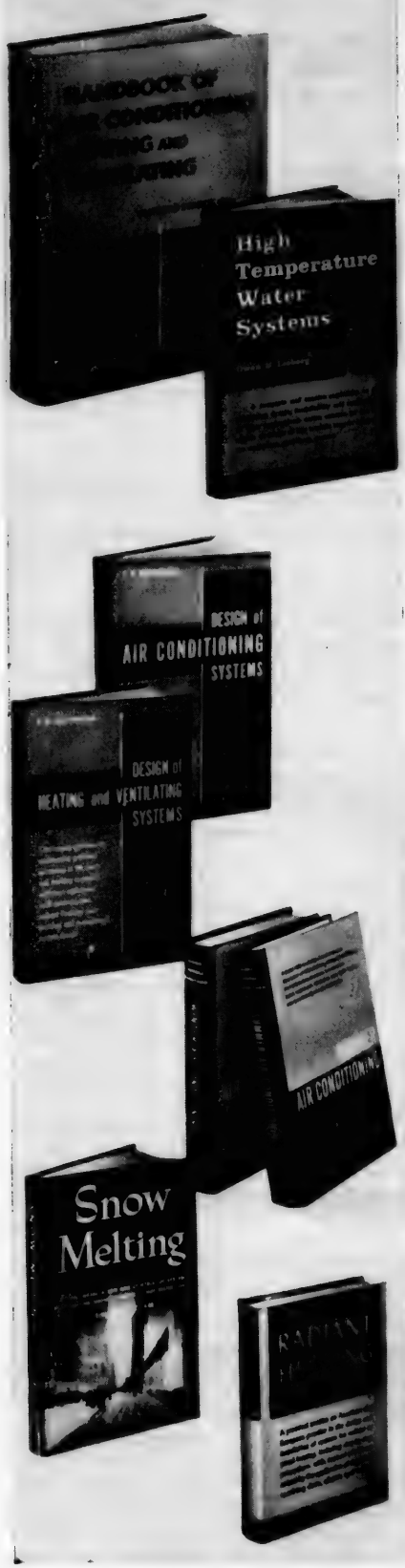
EDITOR, AIR CONDITIONING, HEATING AND VENTILATING:

The article by M. J. Williams on Design and Cost Data for Ice Rinks in your October, 1959 issue is another good reference source when designing installations. I would, however, like to make a comment on the section, Condensation and Fog Problem, on page 86.

The statement is made "To overcome this problem, it is necessary to install dehumidifier units to remove the moisture from the air and lower the dew point temperature of air in the rink below the temperature of the ice surface and structural members." It is not necessary to lower the dew point below the temperature of the ice to avoid fog. It would be necessary to have the dew point of the air surrounding the beams below the temperature of the beams to avoid condensation. This condensation on the roof structural members might be caused by their

(Concluded on page 138)

BOOKS TO HELP YOU IN YOUR WORK



DO YOU DESIGN HEATING SYSTEMS?

Save time, save work. Keep up-to-date with the developments in your field with authoritative references like these.

HANDBOOK OF AIR CONDITIONING, HEATING AND VENTILATING. Edited by Clifford Strock. 1094 pages, 518 tables, 598 illustrations. A wealth of working data for design engineers in air conditioning, heating, ventilating, piping and plumbing and related fields. Solves work problems with easy-to-find, dependable information. 347 pages are devoted to heat and heat transmission and cover subjects such as: fuels and combustion; heat transfer by radiation, convection and conduction; climatic data and maps; winter design temperatures; the degree-day; heat loss estimating; window condensation; steam and hot water systems; boiler ratings; service hot water supply systems; flash steam calculations; warm air heating. $15.00

HIGH TEMPERATURE WATER SYSTEMS. By Owen S. Lieberg. 224 pages, 109 illustrations. The principles, design, operation and economics of high temperature water systems (HTW). Contains the original design data, tables, graphs and specifications used successfully in some of the largest systems now in operation. The ideal working guide features a step-by-step procedure for the design of a typical HTW system. It covers: pressurization; selection of pumps, boilers and valves; piping; controls; space and process heating with HTW; applications; and an entire specification for an HTW boiler and auxiliaries. $6.50

DESIGN OF HEATING AND VENTILATING SYSTEMS. By F. W. Hutchinson. 320 pages. 96 full-page working charts give direct solutions to problems of heating and ventilating involving load determination, duct design, panel heating, solar heating and combustion analysis. Explanatory text, design examples and solutions accompany each chart. DESIGN OF AIR CONDITIONING SYSTEMS. 236 pages. By the same author. Treats the problems of cooling in the same manner as its companion book. Features 115 full-page working charts that solve air conditioning design problems directly. Like DESIGN OF HEATING AND VENTILATING SYSTEMS, background text, examples and solutions accompany each chart.
Each book $7.00, set of both $12.50

WINTER AIR CONDITIONING. By S. Konzo, J. R. Carroll and H. D. Bareither. 640 pages, 300 illustrations. Explains the why and how of controlled distribution of heat and humidity in small buildings and homes. Covers: temperature scales, how to read tables and curves, heating plans, house construction, heat loss calculations, heat generation, boilers, furnaces, radiators, convectors, and all types of warm air and hydronic systems. Includes such working data as heat loss factors for various walls; degree-days; how to estimate fuel consumption; duct design; and much more. Tells how to tailor systems to the needs of individual buildings. SUMMER AIR CONDITIONING. 560 pages, 266 illustrations. By the same authors. This basic what-how-and-why book on residential air conditioning is a training and reference book for all who design, sell, install, or operate air conditioning systems and equipment for houses and small buildings. Like its companion volume, it contains exercises for each chapter to help check reader's understanding.
Each book $8.00, set of both $15.00

RADIANT HEATING. By T. Napier Adlam. Second Edition. 504 pages, 337 illustrations. Contains basic information, design formulas and working data including a step-by-step procedure for designing effective systems. All formulas have been reduced to simplest terms and are accurate for all practical requirements. Simple, easy-to-use charts give most of the essential design data without calculation. $6.00

SNOW MELTING. By T. Napier Adlam. 224 pages, 189 illustrations. The steps in planning, designing, building and operating snow melting systems of all sizes and types are covered. Time-saving charts, tables and graphs give all the necessary data, and simplify every step. $4.50

THE INDUSTRIAL PRESS, 93 Worth Street, New York 13, New York

☐ Please send me the books listed below. I enclose payment in full. Send books postpaid. (Orders from foreign countries – except Canada – must be accompanied by payment in full plus 50¢ per book, postage and handling charges.)

☐ Send books under Five-Day Free Inspection Plan and ☐ Bill me ☐ Bill company. (Postage charges of 15¢ per book will be added.)

.....

.....

.....

Name ..... Company .....

Company Address .....

City ..... Zone ..... State .....

Home Address .....

(Fill in bottom line only if you want books sent to your home.) ACH&V-12/59

MAGNI-CHEK

A SPUN END CHECK VALVE AND STRAINER COMBINATION

Magni-Chek is a non-electric magnetically operated check valve, so finely calibrated that a fraction of an ounce of pressure will open the passage permitting a smooth flow without the usual pressure drop. Since no springs are used back pressure is at a minimum.

CHECK THESE FEATURES

- Built-in Monel Strainer
- Lifetime Alnico Magnet
- Maximum Flow
- Minimum Back Pressure
- Not Affected By Soldering Heat

This valve is also available without the strainer, and both types are stocked in the following sizes: ¼", 5/16", ⅜", ½", ⅝" and ¾". Special size inlet and outlet connections can be made to your specifications.

U.S. PAT. NO. 2,646,071

Send for Illustrated Catalog Dept. V-12

WATSCo INC.

1020 E 15th STREET • HIALEAH, FLORIDA

PROVED ON THOUSANDS OF PRODUCTION LINE INSTALLATIONS!

"250" SERIES

LIQUID EYE®

POSITIVE SEALING INDICATORS

designed to save you even more time and money

DESIGN FEATURE

extension-gasket . . . ALL ONE-PIECE! A built-in gasket that's always in place for positive sealing and foolproof assembly.

6 sizes now available: ⅜", ½", ⅝", ⅞", 1⅛" and 1⅜" O.D.S.

The "250" has all the proved Liquid Eye advantages *plus* these newly engineered features:

- **smaller—more compact, simplified design.**
- **preformed copper extension eliminates need for separate gaskets—foolproof installation.**
- **complete, self-contained, economy unit.**

Write today for catalog E-57 covering the complete Allin line.

ALLIN MANUFACTURING CO.

410 N. Hermitage Ave. • Chicago 22, Illinois

Over 1,000,000 Liquid Eyes Sold to Date!

(Concluded from page 136)

temperature being lower than that of the dew point outdoors and any ventilation air would then cause condensation. In such a case, dehumidification as described would be required.

The other possibility is that the structural members may be rather cold because of a low outside temperature and the moisture output of the occupants may have raised the interior dew point to an objectionable level. In this case, outside air should be brought in and slightly heated before being blown across the roof structure. This may be simpler than dehumidification to such low temperatures with frosting of the coils resulting.

The requirements for eliminating fog over the ice surface are explained on page 57 of the article "Eliminating Man Made Fog" in the December, 1958 issue of AIR CONDITIONING, HEATING AND VENTILATING.

I believe these comments might add to the value of a good article.

Worthington Corporation
A.C. & R. Division

M. A. Ramsey
Consulting Engineer

A copy of Mr. Ramsey's letter was sent to Mr. Williams so that he could comment on the points brought up for discussion. The reply by Mr. Williams follows:

I will have to admit that, for some reason or other, I had not read Mr. Ramsey's article appearing in the December, 1958 issue of AIR CONDITIONING, HEATING AND VENTILATING magazine. Since receiving your letter, I read this article and find it very interesting and informative. I can see that the fogging problem can be overcome by simply introducing outdoor air and reheating it during the winter months. However, as there is a tendency to operate public skating rinks during early fall and late spring, and some owners plan to operate ice rinks during the summer months, I had in mind the operation of rinks during these periods when writing this paragraph in my article. I am still of the opinion that during such seasons of the year, that dehumidification would be desirable. Reheating outdoor air in the summer would have a tendency to overheat the space occupied by the spectators and create an uncomfortable condition.

M. J. Williams
Application Engineering Dept.

The Trane Co.
La Crosse, Wis.

COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available

ASHRAE MEETING—Semi-annual meeting of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, and the 2nd Southwest Heating and Air-Conditioning Exposition, sponsored by ASHRAE, in Dallas, Tex. The meeting will be at the Baker and Adolphus Hotels, and the Exposition in the Memorial Auditorium. Secretary of the Society, 62 Worth St., New York 13, N. Y. ..... **FEBRUARY 1-4, 1960.**

ISA INSTRUMENT-AUTOMATION EXHIBIT—ISA Instrument-Automation Conference and Exhibit, at the Houston Coliseum, Houston, Tex. W. H. Kushnick, executive director, Instrument Society of America, 313 Sixth Ave., Pittsburgh 22, Pa. ..... **FEBRUARY 1-5, 1960.**

LUBRICATION SYMPOSIUM—ASME Lubrication Symposium, at the Engineering Societies Building, New York, N. Y. Secretary, American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y. .....**MARCH 14-15, 1960.**

CORROSION ENGINEERS SHOW—Annual conference and corrosion show of the National Association of Corrosion Engineers, at the Dallas Memorial Auditorium, Dallas, Tex. Secretary of the Association, 1061 M & M Building, Houston 2, Tex. .....**MARCH 14-18, 1960.**

FIRST NATIONAL ELECTRIC HOUSE HEATING EXPOSITION, sponsored by the National Electrical Manufacturers Association, at the Sherman Hotel, Chicago. R. D. Smith, secretary of the Association, 155 East 44th St., N. Y. 17, N. Y. ....**MARCH 21-23, 1960.**

AMERICAN POWER CONFERENCE—22nd annual American Power Conference, sponsored by Illinois Institute of Technology, in cooperation with many technical societies and educational institutions, at the Hotel Sherman, Chicago, Ill. R. A. Budenholzer, conference director, Mechanical Engineering Department of the Institute, 3300 Federal St., Chicago 16, Ill. .....**MARCH 29-31, 1960.**

GAMA MEETING—Annual Meeting of the Gas Appliance Manufacturers Association, at The Greenbrier, White Sulphur Springs, West Va. H. Leigh Whitelaw, managing director of the Association, 60 E. 42nd St., New York, N. Y. .....**MARCH 30-APRIL 1, 1960.**

NUCLEAR CONGRESS—Sixth Nuclear Congress, sponsored by the Engineers Joint Council and the Instrument Society of America, to be held in New York City. Headquarters to be announced later. Director of Technical and Educational Services, ISA, 313 Sixth Ave., Pittsburgh 22, Pa. .....**APRIL 3-8, 1960.**

OHI EXPOSITION AND CONVENTION—23rd National Oil Heat and Air Conditioning Exposition, at the New York Coliseum, held concurrently with the 28th annual convention of OHI, at the Park-Sheraton Hotel, New York City. Secretary, Oil Heat Institute of America, Inc., 500 Fifth Ave., New York 36, N. Y. .....**APRIL 4-7, 1960.**

BRI SPRING CONFERENCE—Building Research Institute Spring Conference at Statler Hilton Hotel, New York, N. Y. Harold Horowitz, Assistant Director for Technical Programs, Building Research Institute, 2101 Constitution Ave., Washington 25, D. C. .....**APRIL 19-21, 1960.**

ASME-SAM CONFERENCE—ASME-SAM Management Conference, at the Statler Hilton Hotel, New York, N. Y. Secretary, American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y. .....**APRIL 21-22, 1960.**

WELDING SOCIETY MEETING—41st Annual Meeting and Welding Exposition of the American Welding Society in Los Angeles Calif. Headquarters to be announced later. A. L. Phillips, secretary of the Society, 33 W. 39th St., New York 18, N. Y. .....**APRIL 25-29, 1960**

WESTERN EXPOSITION—Third Western Air Conditioning, Heating, Ventilating and Refrigeration Exhibit and Conference, Shrine Exposition Hall, Los Angeles, Calif. F. J. Tabery, exhibit manager, 3443 S. Hill St., Los Angeles 7, Calif. Exhibit sponsored by Western Air Conditioning Industries Association. .....**APRIL 27-30, 1960.**

METAL EXPOSITION & CONGRESS—2nd Southwestern Metal Exposition & Congress, at State Fair Park, Automobile Building, Dallas, Tex. C. L. Wells, exposition manager, American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. ....**MAY 9-13, 1960.**

ISA CONFERENCE AND EXHIBIT—ISA Instrument-Automation Conference and Exhibit, at Brooks Hall, San Francisco, Calif. W. H. Kushnick, executive director of the Instrument Society of America 313 Sixth Ave., Pittsburgh 22, Pa. .....**MAY 9-13, 1960.**

DESIGN ENGINEERING SHOW—ASME Design Engineering Conference and Show, at the Statler Hilton Hotel, New York, N. Y. Secretary, American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y. .....**MAY 23-26, 1960.**

(Concluded on page 140)

STOP
WATER HAMMER

CONTROL
Hydrostatic Shock

SPECIFY SHOCK CONTROL
by-- HYDRO-Trol
HYDROSTATIC SHOCK CONTROL

Here's the Shock Control that's been designed to provide a more efficient and permanently effective method of controlling Hydrostatic Shock and eliminating Water Hammer on every Hot or Cold Water Piping System.

Designed to last the life of the piping system without failure, . . . Hydro-Trol is constructed entirely of stainless steel. Its pressurized design utilizes the cushioning effect of both hydraulic and pneumatic pressure to provide its unmatched efficiency in absorbing and controlling the pressures of Hydrostatic Shock and resulting Water Hammer under even the most extreme conditions.

Available in six sizes, Hydro-Trol offers a Simplified Sizing Method that makes it "PLUMB-EASY" to specify and install the correct size on every job.

FOR FURTHER INFORMATION WRITE FOR YOUR COPY OF "SHOCK CONTOL BY HYDRO-TROL"

JAY R. SMITH MFG. CO.
Union, New Jersey
PLUMB-EASY

CHAIR CARRIERS · DRAINS · INTERCEPTORS

World's Favorite
NON-SCALD
SHOWER VALVE

- Proven superior in thousands of installations
- Automatically holds shower temperature constant
- No sudden scalds or chills regardless of water pressure
- Built to last a lifetime . . . only one moving part
- Self-cleaning action prevents clogging — saves water

Symmons
ENGINEERING COMPANY

Send at once for Safetymix folder.

Dept. 3-C, 448 C STREET, BOSTON 10, MASSACHUSETTS

(Concluded from page 139)

SAE MEETING—Summer meeting of the Society of Automotive Engineers, at the Edgewater Beach Hotel, Chicago, Ill. Secretary of the Society, 29 W. 39th St., New York, N. Y. . . . **JUNE 5-10, 1960.**

I-B-R MEETING—Annual meeting of The Institute of Boiler and Radiator Manufacturers, at the Seaview Country Club, Absecon, N. J. Secretary of the Institute, 60 E. 42nd St., New York, N. Y. . . . . **WEEK OF JUNE 6, 1960.**

NDHA MEETING—Annual meeting of the National District Heating Association, at Grove Park Inn, Asheville, N. C. Secretary of the Association, 827 N. Euclid Ave., Pittsburgh 6, Pa. . . . . **JUNE 6-9, 1960.**

ASHRAE MEETING—Annual meeting of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., at Royal York Hotel, Vancouver, B. C., Canada. Secretary of the Society, 62 Worth St., New York 13, N. Y. . . . . **JUNE 13-15, 1960.**

ASTM MEETING—Annual meeting of the American Society for Testing Materials, at the Chalfonte-Haddon Hall, Atlantic City, N. J. Secretary of the Society, 1916 Race St., Philadelphia 3, Pa. . . . . **JUNE 26-JULY 1, 1960.**

CONGRESS ON OCCUPATIONAL HEALTH—13th International Congress on Occupational Health, at the Waldorf Astoria Hotel, New York City. James W. Muckell, executive secretary, Room 415, 527 Madison Ave., New York 22, N. Y. . . . . **JULY 25-29, 1960.**

ISA EXHIBIT AND MEETING—ISA Instrument-Automation Conference and Exhibit, in conjunction with the 15th annual meeting, at the Coliseum, New York, N. Y. W. H. Kushnick, executive director, Instrument Society of America, 313 Sixth Ave., Pittsburgh 22, Pa. . . . . **SEPTEMBER 26-30, 1960.**

Canadian Degree-Days for October, 1959*

City	October		Cumulative	
	1959	Normal	1959	Normal
Calgary, Alta.	795	710	1312	1120
Charlottetown, P. E. I.	570	550	790	790
Crescent Valley, B. C.	721	680	1150	1010
Edmonton, Alta.	872	750	1353	1190
Fort William, Ont.	775	740	1094	1110
Grande Prairie, Alta.	915	800	1419	1250
Halifax, N. S.	467	469	623	659
London, Ont.	493	490	640	640
Medicine Hat, Alta.	761	600	1021	900
Moncton, N. B.	603	590	848	850
Montreal, P. Q.	563	550	715	740
North Bay, Ont.	773	670	1038	990
Ottawa, Ont.	628	580	809	780
Penticton, B. C.	567	520	810	720
Prince George, B. C.	813	750	1314	1210
Quebec City, P. Q.	692	650	942	940
Regina, Sask.	941	750	1355	1120
St. John, N. B.	587	590	862	950
Saskatoon, Sask.	952	760	1401	1140
Timmins, Ont.	907	780	1253	1190
Toronto, Ont.	455	465	576	619
Vancouver, B. C.	449	440	702	660
Victoria, B. C.	461	410	774	640
Windsor, Ont.	424	410	519	530
Winnipeg, Man.	904	686	1211	997

* These data are supplied through the courtesy of the Meteorological Division, Air Service Branch, Department of Transport, Canada.

Here's the LOW COST Answer to the Hot Water Problem for Coin-operated Laundries, Restaurants, Motels, Schools, Clinics, Apartments, Small Plants

Ewing HEAVY-DUTY AUTOMATIC COMMERCIAL

Uses Any Type Gas

Vertical—Requires So Little Floor Space!

No Expensive Storage Tanks Needed!

Low Original Cost!
Economical Operation!
Trouble-Free Operation!
Simple To Install!
Automatic Controls!

Write or wire for prices and complete details

Hot Water Heater

Provides a constant, plentiful supply of 180 degree HOT WATER! Automatic TROUBLE-FREE operation! Compact! . . . Quickly and easily installed . . and ABSOLUTELY SAFE! Amazingly efficient and economical. Ask a Ewing user what he thinks of his Ewing heater.

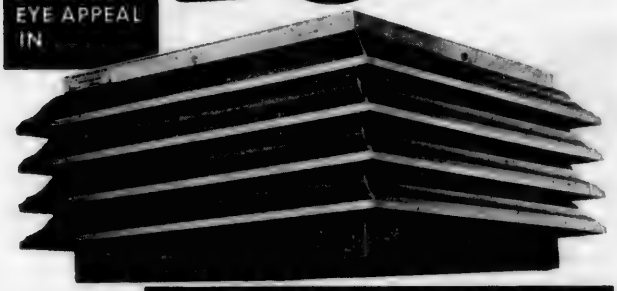
THREE SIZES:—190,000—315,000—520,000 BTU input. Recovery capacities up to 500 gallons per hour at 100 degree temperature rise. Storage capacities 50 to 145 gallons. Inside surfaces treated with metal protective to assure long life and clean, clear water. Heavy duty magnesium rod incorporated with each unit.

Constructed in accordance with requirements of A.S.M.E. Boiler and Pressure Code. Each heater is registered with National Board of Boiler and Pressure Inspectors. All Safety controls listed by AGA.

Ewing MANUFACTURING CO.
2545 NW 10 P. O. BOX 875
OKLAHOMA CITY, OKLA.

ALL FUNCTIONAL FEATURES PLUS EYE APPEAL IN

Low Silhouette



WAUSAU AIR MOVER

- **MODERN DESIGN** — Aluminum Extrusions designed to permit low outlet velocities . . . housing completely weatherproof.
- **NO UNSIGHTLY CURB MOUNTINGS** — Point of Discharge used in design makes unsightly curb mountings unnecessary.
- **MORE RIGID WHEEL SUSPENSION** — Unique bearing arrangement places fan wheel center of gravity between the bearings provided, more rigid wheel suspension system . . . bearing well also adds rigidity.
- **NO INLET OBSTRUCTIONS** — Air stream is free of all braces, cross members and other obstructions which produce turbulence and noise.
- **EASY ACCESS FOR SERVICING AND LUBRICATING** Bearings are accessible for easy lubricating. Bearings designed for belt drive application; totally enclosed designed for long life . . . motor (ball bearing motor and explosion proof also available).

Write for new catalog, complete details and specifications.

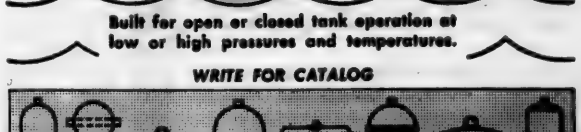
GREENHECK FAN & VENTILATOR CORP.
SCHOFIELD • WISCONSIN

HARRIS INDUSTRIAL FLOATS

COPPER
STAINLESS STEEL
MONEL
STEEL
BRASS
ALUMINUM

Built for open or closed tank operation at low or high pressures and temperatures.

WRITE FOR CATALOG



ARTHUR HARRIS & CO.
Established 1874
206 N. Aberdeen St.
Chicago, Ill.

ALPHABETICAL INDEX OF ADVERTISERS

A

Aerofin Corp. 5
Aerovent Fan Co., Inc. ..... *
Air Conditioning & Refrigeration Institute ..... *
Air Devices, Inc. 40
Air Filter Corp. ..... *
Air Filter Institute ..... *
Airtemp Div., Chrysler Corp. 107
Alco Valve Co. ..... *
Allen-Bradley Co. 13
Allen Cooler & Ventilator, Inc. 136
Allin Manufacturing Co. 138
American Brass Co. 2
American Gas Association 28-29
American Machine and Metals, Inc. 37
Anemostat Corp. of America 35
Armstrong Machine Works 1
Arno Adhesive Tapes, Inc. ..... *

B

Babbit Steam Specialty Co. ..... *
Barber-Colman Co. 122-123
Bell & Gossett Co. 44
Bethlehem Steel Co. 111
Bohn Aluminum & Brass Corp. ..... *
Bridgeport Brass Co. 24-25
Bryan Steam Corp. ..... *
Buensod-Stacey, Inc. 9
Buffalo Forge Co. 27
Buffalo Pumps Div., Buffalo Forge Co. *
Burnham Corp. ..... *
Burt Manufacturing Co. 131

C

Cain Manufacturing Co., Inc. ..... *
Cambridge Filter Corp. 22-23
Chicago Pump Co. 124
Chrysler Corp., Airtemp Div. 107
Clarage Fan Co. ..... Inside Back Cover
Classified Advertisements 143
Cleaver-Brooks Co., Boiler Div. 132
Coyne & Delany Co. ..... *
Cyclotherm Div., National-U. S. Radiator Corp. ..... *

D

DeBothezat Fans Div., American Machine and Metals, Inc. 37
Dravo Corp. ..... *
Drayer-Hanson Div., National-U. S. Radiator Corp. ..... *
Dunham-Bush, Inc. 121
Dwyer, F. W., Manufacturing Co. 128

E

Elgo Shutter & Mfg. Co. ..... *
Ewing Manufacturing Co. 141

F

Fafnir Bearing Co. 21
Flexaust Co. 128
Frick Company 120

G

Governair Corp. ..... *
Green-Bayley Blower Div., Green Fuel Economizer Co., Inc. 129
Greenheck Fan & Ventilator Corp. 141
Gustin-Bacon Manufacturing Co. ..... *

H

Halstead & Mitchell 43
Harris, Arthur & Co. 141
Hartzell Propeller Fan Co. 127
Heat-Timer Corp. 105
Henry Valve Co. ..... *
Hoffman Specialty Manufacturing Corp. 7

I

Illinois Testing Laboratories, Inc. 108
Industrial Press 26, 137
Inland Steel Co. 114
International Boiler Works Co. ..... *
Iron Fireman Manufacturing Co. 109

J

Jenkins Bros. 115
Jenn-Air Products Co., Inc. 113
Johns-Manville 36, 38-39
Johnson Service Co. ..... Back Cover

L

Lawler Automatic Controls, Inc. ..... *
Lennox Industries, Inc. 130

M

Magnetrol, Inc. ..... *
Marsh Instrument Co., Div. Colorado & Gas Corp. 48
McDonnell & Miller, Inc. 41
McQuay, Inc. 33
Mercoid Corp. 130
Minneapolis-Honeywell Regulator Co. 116-119

N

Nash Engineering Co. 50
National Tube Div., United States Steel Corp. 20
New York Blower Co. 47
Niagara Blower Co. 134
Nibco, Inc. 11

P

Patterson-Kelley Co., Inc. ..... *
Peerless Electric, Div., H. K. Porter Co., Inc. 125
Petro ..... *
Pittsburgh Plate Glass Co. 18-19
Porter, H. K., Co., Inc. 46
Powers Regulator Co. ..... *

(Continued on page 144)

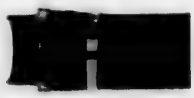
a quiet answer to noisy piping...

VM QUIET-FLEX

Style RFE— Integral molded rubber flanges keep entire hose length flexible . . . eliminate gaskets. Steel backup rings distribute bolt pressure.

REINFORCED FLEXIBLE RUBBER PIPE SECTIONS

Completely isolate pipe lines from pumps, centrifugal compressors, condensing units, water chillers and cooling towers. Quiet-Flex rubber pipe connections will withstand working pressures up to 250 psi . . . continuous operating temperatures up to 250°F.



Style MM— Brass fitted couplings with male pipe threads provide leak-proof connection with uniform full flow area. Stock sizes—¾" through 4" diameter in lengths 12" through 36".

Write for descriptive Bulletin RFP-10 and Vibration Engineering Data Book.

If it's a noise or vibration problem, get the right answer — quick — from Representatives in Principal Cities of United States and Canada.

VIBRATION MOUNTINGS, INC.

98-33 50th Avenue • Corona 68, New York

Classified Advertising

Sold at $12 per single column inch.

WANTED—SALES ENGINEER

THE PITTSBURGH PLATE GLASS COMPANY has an excellent opportunity for a graduate M.E., Ch.E., C.E., or Bus. E. Fiber Glass sales engineer to do product application work with manufacturers in thermal and acoustical insulation fields. The position involves no sales but requires constant customer and internal division contact in an engineering capacity. Some travel; downtown Pittsburgh, Pennsylvania location. Send detailed resume to Mr. R. R. Esler, Industrial Relations Department, One Gateway Center, Pittsburgh 22, Pennsylvania.

WANTED
DESIGN & DEVELOPMENT ENGINEER

Experienced in the development of gas fired residential heating equipment. Send complete resume including salary requirements to Harold Rush, Stewart-Warner Corporation, Heating and Air Conditioning Division, Lebanon, Indiana.

WANTED
AIR CONDITIONING DESIGN ENGINEER

Graduate Mechanical Engineer with two or more years Product Design experience. Design Air Conditioning equipment, co-ordinate manufacture and testing of Pilot Models. Select and recommend materials and component parts for product. Send complete resume including salary requirements to Harold Rush, Stewart-Warner Corporation, Heating and Air Conditioning Division, Lebanon, Indiana.

PRINTED FORMS available for immediate shipment. Heating & oil burner materials form, burner service record cards, service order forms, inspection information form, survey sheet and others. Also can supply BURNER SERVICE form in 8 part EZE-SNAP with 3 carbons in each set, 1200 sets. Imprinted with your name, address and telephone, only $20.40. Send for samples—no obligation. Write Dept. AC, Degree Day Systems, 39-30 58th St., Woodside 77, N. Y.

MANUFACTURERS' AGENTS

An established manufacturer with 25 years experience producing ventilating equipment is looking for manufacturer's agents in many sections of the country to sell their new line of industrial fans. The products include axial flow and tubeaxial fans, both direct and belt driven, and power roof ventilators.
Please reply Box 914, Air Conditioning, Heating & Ventilating, 93 Worth St., New York 13, N. Y.

WANTED

Manager of Air Conditioning Engineering to assume management of product design and development of well established eastern manufacturer. Products include packaged equipment, chillers, fan coil units, heat pumps, air handling equipment and some commercial refrigeration. Must have proven technical and administrative ability. Send resume of qualifications to Box 957, Air Conditioning, Heating & Ventilating, 93 Worth St., New York 13, N. Y.

WANTED—SALES MANAGER-FANS

Manufacturer of fans looking for M.E. experienced all phases mechanical draft fan design and selling for administrative position with unlimited opportunities for salary and management growth. Send resume and salary requirements. Write Box 955, Air Conditioning, Heating & Ventilating, 93 Worth St., New York 13, N. Y.

WANTED ENGINEERS

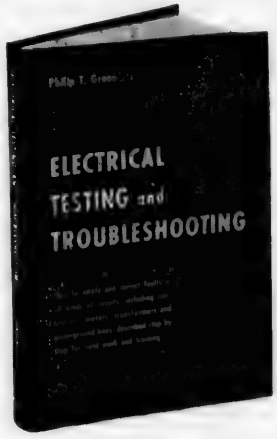
To work in the expanding Construction Engineering Division of a multi-plant national packaging company located in Chicago. This division is responsible for all new construction as well as major remodeling to present facilities, located throughout the United States and Canada.

Applicants must have a Mechanical Engineering Degree and have experience in the development of building designs and layouts for new or remodeled industrial plants and research laboratories. Major industrial experience should be in the fields of heating, ventilating and air-conditioning. He will be required to layout such systems, consult with architects and contractors and advise and assist plant on these types of problems.

Please send resume. All replies confidential. Box 956, Air Conditioning, Heating & Ventilating, 93 Worth St., New York 13, N. Y.

LOCATE AND CORRECT FAULTS IN CIRCUITS

Expert Describes Tested Procedures In Testing and Troubleshooting



Let an expert explain how to locate and correct faults in circuits of all kinds. Just look at the table of contents below for a listing of the topics it covers in detail. *Electrical Testing and Troubleshooting* is written in an easy-to-understand manner. Only a basic knowledge of simple arithmetic is necessary to use and comprehend the principles and procedures set forth.

All of the troubleshooting procedures described have been tested in the field, and have been proved to be great time-savers, especially for locating obscure sources of trouble. Most of these tests can be performed with the equipment isolated from the power line—current is supplied by dry cells or residual magnetism—for greatest safety.

Send for your copy today. *200 Pages, 100 Illustrations.* *$5.00.*

To order, use coupon below or circle letter G on postcard, last page.

CONTENTS

Electrical Symbols and Drawings
Analyzing and Charting Controller Operation
Troubleshooting Test Equipment
Insulation Testing
Locating Grounds
Electromagnet Windings
D-C Machine Windings
Single-Phase Transformers
Phase Sequence
Polyphase Transformers
Polyphase Induction Motors
Synchronous Machines
Power Cable Faults
Bearing Lubrication

THE INDUSTRIAL PRESS, 93 Worth Street, New York 13, N. Y.

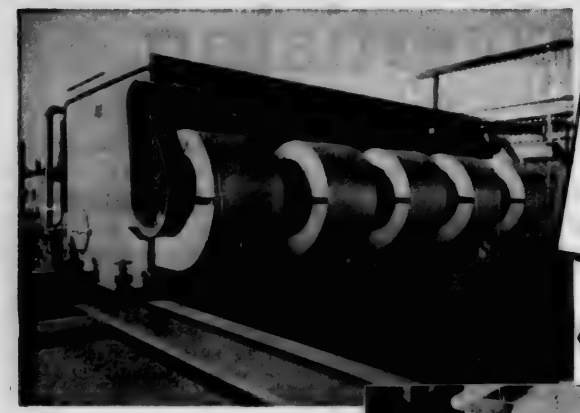
Please send me ..... copies of Electrical Testing and Troubleshooting

☐ Check or money order is enclosed. Send book(s) postpaid.

☐ Send book(s) and invoice, including postage. I will pay within five days if I decide to keep the book(s).

☐ Bill me ☐ Bill company

Name .....
Company .....
Company Address .....
City ..... Zone .... State .....
Home Address .....
(Please fill in if you want book sent to your home) ACH&V 12/59

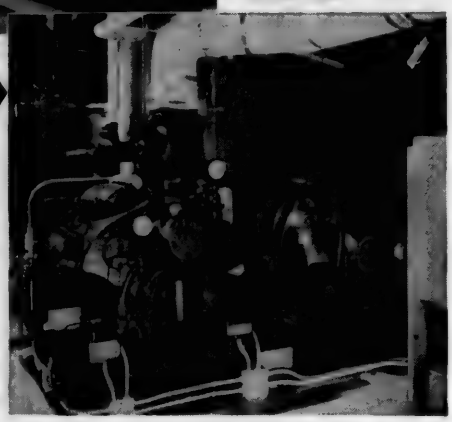


Vilter Report Card

Grade	Service Record
A	Efficient, alternating zone-load operation.
A	Exceptionally low operational cost.
A	Uninterrupted air conditioning service.
A	Smooth operation with minimum maintenance.

View of the Vilter VXF evaporative condenser located on the roof just outside the compressor room.

View of one of the two Vilter 8-cylinder VMC Freon compressors with a 100 h.p., 1175 r.p.m., part winding motor drive. These compressors are located on an upper floor, above an office.



Cool Thinking ...Cool Fun in Marquette University's Air Conditioned Brooks Memorial Union

Brooks Memorial Union is the hub of many Marquette University activities—professional meetings and conferences attracting a national audience, exciting school dances, excellent food facilities in the cafeteria, snack bar and private dining rooms. One key to its year-'round popularity and usefulness is the air conditioned comfort provided by the Vilter installation on this Milwaukee Campus.

To provide adequate air conditioning on a conservative appropriation and to minimize yearly operating expenses, the system was laid out to provide alternating zone-load cooling based on a "traffic flow" and usage pattern. During normal occupancy the entire Union is cooled. However, at peak loads only part of the conditioned space in Brooks Memorial is cooled at one time. As the peak occupancy load shifts from cafeteria and grill to the ballroom-conference room, the air conditioning is also shifted. Results of operating in this manner have been highly satisfactory.

Vilter equipment furnished on this job included two 8-cylinder VMC compressors; VXF Freon evaporative condenser; Freon liquid receiver; heat exchanger, cooling coils, motors, and controls.

"Very satisfactory performance with only routine maintenance," is the praiseworthy comment by Marquette University officials.

Let Vilter help you with your air conditioning and refrigeration requirements.

Write for these helpful bulletins to: The Vilter Manufacturing Company Dept. G-804, 2217 S. First Street, Milwaukee 7, Wisconsin

Bulletin 631 Vilter Uni-Chiller

Bulletin 820 Vilter VMC Freon Compressors

Bulletin 732 VXF—VSC Evaporative Condensers

Vilter®

REFRIGERATION and AIR CONDITIONING

THE VILTER MANUFACTURING COMPANY, Milwaukee 7, Wisconsin

Air Units • Ammonia & Freon Compressors • Booster Compressors • Bandaloi Coolers • Water & Brine Coolers • Blast Freezers • Evaporative & Shell & Tube Condensers • Pipe Coils • Valves & Fittings • Pakice & Polarflake Ice Machines

ALPHABETICAL INDEX OF ADVERTISERS

(Continued from page 142)

Q

Quickdraft Corp. 110

R

Radiant-Ray Radiation, Inc. ..... *
Reading Tube Corp. 15
Research Products Corp. ..... *
Revere Copper & Brass, Inc. 32
Reznor Manufacturing Co. 16
Ric-Wil, Inc. 30

S

St. Clair Rubber Co. 133
Sarco Co., Inc. ..... *
Skidmore Corp. 31
Smith, Jay, R., Mfg. Co. 139
Southwest Heating & Air-Conditioning Exposition 135
Spence Engineering Co., Inc. ..... *
Sporlan Valve Co. 17
Spraying Systems Co. 133
Sterling, Inc. 112
Stoddard Industries ..... *
Sturtevant Div., Westinghouse Electric Corp. ..... *
Symmons Engineering Co. 140

T

Taco Heaters, Inc. ..... *
Todd Shipyards Corp. 134
Tuttle & Bailey Div., Allied Thermal Corp. 49

U

United States Steel Corp., National Tube Div. 20

V

Ventil-Aire Corp. ..... *
Vibration Mountings, Inc. 142
Vilter Manufacturing Co. 144

W

Wagner Electric Corp. ..... *
Waterloo Register Co., Inc. ..... *
Watsco, Inc. 138
Watts Regulator Co. ...Inside Front Cover
Webster, Warren & Co., Inc. ..... *
Weil-McLain Co. ..... *
Weil Pump Co. 133
Weirton Steel Co., Div., National Steel Corp. 45
Weksler Instruments Corp. ..... *
Westinghouse Electric Corp., Sturtevant Div. ..... *
Wheeling Steel Corp. 34
Wiremold Co. ..... *

Y

Yarnall-Waring Co. 42

* Advertiser appeared in preceding issue

Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail a prepaid multipurpose postcard, either of two that appear on the yellow page following, to request further information from manufacturers.

PRESSURE REGULATORS ..... for commercial, industrial and institutional application have been made by Watts Regulator Co. for over 82 years. Two folders are offered.
Inside Front Cover — Item 200

STEAM TRAP CAPACITY ..... is the subject of an informative ad by Armstrong Machine Works. Additional information on trap capacity, selection and installation is offered in 48-page steam trap book.
Page 1 — Item 201

TIME-SAVING FITTINGS ..... are available from The American Brass Co. There is a "right" Anaconda fitting for every connection and they are listed in a catalog which is available.
Page 2 — Item 202

COOLING COILS ..... and heating coils from Aerofin Corp. were installed in Western Electric Company's new Merrimack Valley works. They permit ample heat exchange capacity in limited space. Information is available.
Page 5 — Item 203

NO-LOSS STEAM TRAPS ..... from Hoffman Specialty Mfg. Corp. incorporate design features which assure both effective and economical removal of condensate from steam lines and equipment: low, medium, and high pressure thermostatic traps with renewable thermostats and valve seats; float and thermostatic traps; inverted bucket traps. Catalogs are offered.
Page 7 — Item 204

DUAL DUCT AIR MIXING UNITS ..... are the flexible, economical answer to your floor-by-floor air distribution problems. Ad, third of a series by Buensod-Stacey, illustrates this fact. Information is available.
Page 9 — Item 205

COPPER FITTINGS ..... from Nibco are strong where it counts. These fittings are stronger than the tube they join. Catalog is available.
Page 11 — Item 206

PRESSURE AND TEMPERATURE ..... controls from Allen-Bradley provide longer life, lower differentials, and attractive appearance for air conditioning and refrigeration applications. Information is available.
Page 13 — Item 207

COPPER TUBING LINE ..... available from Reading Tube includes: Lektroneal copper tube; Lektroseal copper refrigeration tube; Readi-Fin finned copper tube; and Mackenzie Walton precision copper tube. Also commercial copper tube, red brass and copper pipe. Information is available.
Page 15 — Item 208

FIVE-WAY HEATERS ..... made by Reznor Mfg. Co. are demanded by tough buyers to project heat where needed on difficult jobs with no waste. Information is available.
Page 16 — Item 209

MOISTURE INDICATOR ..... from Sporlan Valve Co. takes the guesswork out of servicing refrigeration equipment. A single green dot indicates when system is dry; a full-view sight glass shows if the system is fully charged. Bulletin is offered.
Page 17 — Item 210

FIBER GLASS INSULATION ..... products provide top thermal and acoustical control, and help you save installation time. Products include duct insulation, duct liner, and pipe insulation. Information is offered by Pittsburgh Plate Glass Co.
Pages 18-19 — Item 211

STEEL PIPE ..... bearing USS National brand is providing 27,000 feet of heat at the U. S. Air Force Academy near Colorado Springs, Colo. Information is available.
Page 20 — Item 212

SUPER-QUIET BALL BEARINGS ..... from The Fafnir Bearing Co. applied to the blower shaft mountings of the Lennox Landmark year-round conditioner provide whisper quiet service which is as much a comfort feature as the "made to measure" heating and cooling. Bulletin is available.
Page 21 — Item 213

HIGH-VELOCITY FILTERS ..... from Cambridge Filter Corp. were selected for the new Equitable Life Assurance Society building. Filters are highly efficient on atmospheric dust. Bulletin describes them.
Pages 22-23 — Item 214

PLUMBING BRASS GOODS ..... for Bridgeport Brass Co. will be produced in a million-dollar modern plant which is designed to make efficient use of automation techniques and equipment. Information on the resulting quality line of products is available.
Pages 24-25 — Item 215

NEW AIR-COOLED CONDENSERS .... from Buffalo Forge Co. offer trouble-free operation. They are a sound engineering choice for your problem air conditioning installation. Information is available.
Page 27 — Item 216

WITH GAS AIR CONDITIONING ..... from York Corp., our boilers keep us cool all summer. So states President Mather of the Allen Manufacturing Co., makers of hex-socket screws. Information is available.
Pages 28-29 — Item 217

Ad-Digest

INQUIRY SERVICE FOR ADVERTISED PRODUCTS

Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail a prepaid multipurpose postcard, either of two that appear on the yellow page following, to request further information from manufacturers.

PREFABRICATED INSULATED PIPING .. from Ric-wiL was specified and installed for the underground piping system at award-winning Linton High School. Information is available.
Page 30 Item 218

NEW HEATING PUMP ..... has vertical close-coupled pump and motor unit bolted to receiver. Receiver is cast iron for long wear. Low returns. Quiet operation. Comes completely assembled. Bulletins are available from Skidmore Corp.
Page 31 Item 219

COPPER DRAINAGE LINES ..... by Revere were used instead of cast iron at Clark County Memorial Hospital, Jeffersonville, Ind., and money was saved. Information is available.
Page 32 Item 220

INDIVIDUAL ROOM CONDITIONERS .. from McQuay, Inc., utilize central station heating and cooling, and are efficient, versatile and dependable. Information is offered.
Page 33 Item 221

GALVANIZED SHEETS ..... produced by Wheeling Steel are an integral part of any effective air conditioning system. Works easily and smoothly so that duct seams are always tight and right. Galvanized coating never flakes or peels. Information is available.
Page 34 Item 222

AIR DIFFUSION EQUIPMENT ..... is produced by Anemostat in an impressive variety to meet every architectural and engineering requirement. Trademark guarantees quality. Information on complete line is available.
Page 35 Item 223

ASBESTOS-CEMENT PIPE BOOKLET ... offered by Johns-Manville contains 24 pages. Describes the layout and installation economies, wide variety of fittings, diameters, and lengths, its adaptability to venting service. Never needs painting, easily cut, resists most gases, fumes, and dusts.
Page 36 Item 224

A PROTECTIVE HOUSING ..... shields a DeBothezat Bifurcator motor from contact with hot and corrosive fumes. The result: smoother operation and lower motor maintenance cost. Information is offered.
Page 37 Item 225

FIBER GLASS DUCT LINER ..... offered by Johns-Manville keeps air ducts quiet and makes them more efficient. Of light weight material, resilient and strong, rolls are easy to cut and fit, as well as pleasant to handle. Provides maximum insulation value for dollar invested. Specification and installation data available.
Pages 38-39 Item 226

AIR DIFFUSERS ..... with built-in diffusing vanes control every cubic foot of air in any enclosure. Agit-air outlets, from Air Devices, Inc., offer predictable air distribution. Information is available.
Page 40 Item 227

FLOW SWITCHES ..... offered by McDonnell & Miller do many jobs. They will actuate a signal light, sound an alarm, stop or start motors, start or stop automatic burners, and actuate metering devices. Bulletin offered.
Page 41 Item 228

PACKED EXPANSION JOINTS ..... produced by Yarnall-Waring guarantee continuous service. GunPakt joints never need repacking, are rugged, dependable, all-steel units. Many in service over 25 years with only nominal maintenance and no major repairs. Bulletin is offered.
Page 42 Item 229

QUIET AIR-COOLED CONDENSERS ... offered by Halstead & Mitchell have had fan noise, vibration, and rattling engineered out of them. Deep pitch fans are run at slow speeds. Casings are rugged and will not loosen with use. Provision for winter operation and multiple circuiting. Information is available.
Page 43 Item 230

HEAT EXCHANGERS ..... for heating or cooling liquids or gases are built by Bell & Gossett Co. to ASME Code requirements. The company offers a brochure, The ASME Story.
Page 44 Item 231

LOCK-SEAMING OPERATIONS ..... can give trouble; if they do, Weirton Steel Co. recommends switching to its zinc coated steel as other fabricators are doing. Booklet is available.
Page 45 Item 232

FISHMOUTH BRANCH FITTINGS ..... offered by H. K. Porter cost, for example, only 81c for 2-inch size for run pipe to 36 inches. Makes the difference between breaking even and making a profit on competitive contracts. A 16-page booklet tells the whole story.
Page 46 Item 233

QUIET OPERATION ..... of the AcoustaFan manufactured by The New York Blower Co. is due to its flow-nozzle air foil wheel. A descriptive bulletin is offered.
Page 47 Item 234

DIAL THERMOMETERS ..... are offered in new and complete line by Marsh Instrument Co. for piping and duct work. For use on heating and cooling equipment, air ducts, vessels, kilns, ovens, etc. Bulletin tells the whole story.
Page 48 Item 235

AIR DISTRIBUTION EQUIPMENT ..... manufactured by Tuttle & Bailey was installed in the nation's significant buildings in 1959 as in previous years. Information is available.
Page 49 Item 236

ZONING VALVE ..... offered by Heat-Timer has 100% shut-off for positive temperature control on steam, hot and chilled water systems. New brochure containing layouts, applications, customer benefits, technical data, and prices is available.
Page 105 Item 237

The items appear in the same order as the advertisements to which they refer, to facilitate obtaining further information after reading an advertisement. All advertisements are digested here except those that are received too late for inclusion in this listing.

Ad-Digest

INQUIRY SERVICE FOR ADVERTISED PRODUCTS

PACKAGED AIR CONDITIONING ..... by Chrysler Airtemp includes, as standard equipment, important features that would cost up to $364 to add to conventional air conditioning. Information is offered.
Page 107 Item 238

DIRECT READING VELOMETER ..... measures actual air delivery. Simple, direct reading gives instant measurement in any distribution system. Alnor velometer is portable, easy to understand and to use. Bulletin is available.
Page 108 Item 239

DUAL FUEL FORCED DRAFT BURNERS.. from Iron Fireman make firebox boilers super-efficient. They cut costs, conserve boiler heat, produce no smoke, and require no stack. Information is available.
Page 109 Item 240

POWER DRAFT UNIT ..... for industrial, residential and institutional exhausting, is available from Quickdraft. It increases heating and combustion efficiency with no motors, fans or bearings in exhaust lines. Engineering data are offered.
Page 110 Item 241

CONDENSATE PUMP ..... from Sterling, Inc., is designed specifically for small installations, yet adequate for jobs up to 2000 sq ft EDR. It allows accurate adjustment, is exceptionally quiet and dependable. Information is available.
Page 112 Item 242

WHEN EXHAUST FANS ..... with big air moving capacities are specified, Jenn-Air's new Hi-D power exhausters meet the call. Also recommended are the company's all-aluminum, low-contour relief vents. Information is available.
Page 113 Item 243

GALVANIZED SHEET ..... made by Inland Steel Co. will not peel or flake. Ti-Co sheet is tough, firm, yet soft enough to take the most complicated forming: Pittsburgh lock-seaming or any other tough fabricating process. Information available.
Page 114 Item 244

MEN OF METALS ..... chose Jenkins valves for all plumbing, heating and air conditioning lines at Metals Park, new headquarters of the American Society for Metals. Information on company's valves is offered.
Page 115 Item 245

A MASTER CONTROL ..... for your central fan system is the new Honeywell transistorized control which combines the best of electronics and pneumatics. Wide choice of specialized sensing elements is offered. Information is available.
Pages 116-120 Item 246

ELECTRONIC AIR CLEANER ..... from Minneapolis-Honeywell offers flutter-jet washing. It removes 95% of all airborne dirt. Information is offered.
Pages 116-120 Item 247

A SELECTION FROM ..... the industry's greatest line of compressors, condensers, coolers, coils and controls is offered to Frick distributors and users. Information is available.
Page 120 Item 248

ROOM AT THE TOP ..... and compact Dunham-Bush equipment enabled Midway Bowl to include customer comfort in remodeling plans. Information is available.
Page 121 Item 249

CONSTANT VOLUME REGULATORS .. from Barber-Colman offer these advantages in high velocity air transmission: Greater design flexibility, stable air delivery, and self-balancing operation of branch ducts. Catalog is available.
Page 122 Item 250

NEW MOTOR OPERATOR ..... from Barber-Colman Co. is transistorized for proportional control. Electronically controlled device offers superior performance and low maintenance. Brochure is available.
Page 123 Item 251

FOR PUMPING SEWAGE ..... and other liquids containing solids, and for sump pump applications, Chicago Pump Co. offers its Immersipump submersible non-clog sewage and sump pump. Information is available.
Page 124 Item 252

HEAVY-DUTY WHEELS ..... in Peerless Electric air moving equipment are completely arc welded into one homogeneous whole. Catalogs on equipment are available.
Page 125 Item 253

FIBER GLASS DUCT FAN ..... from Hartzell, installed to exhaust acid fumes from over a row of plating tanks, reduced corrosion of sprinkler system heads for one company. Information on fans and other ventilation products is available.
Page 127 Item 254

NEW FILTER GAGE ..... from F. W. Dwyer tells exactly when to change filters, lasts indefinitely, and fits all furnace and air conditioning units. Costs only $1.95. Free sample offered.
Page 128 Item 255

FLEXIBLE HOSE ..... from The Flexaust Co. is adaptable for all kinds of fume and dust control and ventilation uses. It is durable, lightweight, and easy to install. Details are available.
Page 128 Item 256

VENTILATION FANS ..... at both ends of Pittsburgh's new Fort Pitt tunnel were Bayley Type AP Series 4 units. Information on company's fans is available.
Page 129 Item 257

INDUSTRIAL HEATER ..... has remarkable adaptability. Lennox Series OG units have efficient heat transfer design resulting in reduced physical heater size. Dual fuel power burners. Spec sheets are offered.
Page 130 Item 258

Ad-Digest

INQUIRY SERVICE FOR ADVERTISED PRODUCTS

Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail a prepaid multipurpose postcard, either of two that appear on the yellow page following, to request further information from manufacturers.

LIGHTWEIGHT PRESSURE CONTROL . . . from The Mercoid Corp. is recommended for mediums not injurious to steel or silver solder. Ad describes circuit, operating range and construction. Bulletin gives additional data.
Page 130 Item 259

SPUN ALUMINUM VENTILATORS . . . . . are offered by The Burt Mfg. Co. in both direct drive and V-belt drive units. A databook which is available describes the company's complete line of modern roof ventilators.
Page 131 Item 260

HEATING BOILERS . . . . . of advanced design, Cleaver-Brooks Progress boilers, with integrated package design pay big dividends in economical production of steam or hot water. Information is offered.
Page 132 Item 261

INSULATION ADHESIVE . . . . . from St. Clair Rubber Co. is specially formulated, and offers 30% savings on labor cost, a permanent bond, and a neater job. Information and sample are available.
Page 133 Item 262

SPRAY NOZZLES . . . . . and all related accessories for humidifying are available from Spraying Systems Co. For industrial installations of every size. Everything but the piping, wiring and compressor. Bulletin is available.
Page 133 Item 263

CAST IRON RECEIVER . . . . . from Weil Pump Co. is a simple, complete unit. It requires only one return line connection, one discharge line connection, and one electrical connection. Bulletin is offered.
Page 133 Item 264

OIL BURNERS . . . . . plus burners for gas and oil-gas are offered by Todd Shipyards Corp. They have low installation and maintenance cost, yet many years of dependable service. Information is available.
Page 134 Item 265

ECONOMICAL CONDENSERS . . . . . from Niagara Blower Co. are lower in first cost and bring greater returns in power savings, water savings, and reduced maintenance expense. Two bulletins are offered.
Page 134 Item 266

SOUTHWEST H&AC SHOW . . . . . in Dallas, Texas, Feb. 1 to 4, 1960, will permit you to see the newest equipment. Complete information on the 2nd Southwest Heating and Air Conditioning Exposition, under the auspices of ASHRAE, is available.
Page 135 Item 267

ROOF VENTILATION LINE . . . . . from Allen Cooler & Ventilator, Inc., meets all requirements efficiently and economically. Low contour units, high velocity units, wind-driven turbines, and exhaust fans. Catalog is available.
Page 136 Item 268

POSITIVE SEALING INDICATORS . . . . . made by Allin Mfg. Co proven on thousands of production line installations have one piece extension gasket for positive sealing and fool-proof assembly. Six sizes. Complete line catalog available.
Page 138 Item 269

SPUN END CHECK VALVES . . . . . and strainer combination, made by Watsco, is so finely calibrated that a fraction of an ounce of pressure will open the passage, permitting a smooth flow without the usual pressure drop. Catalog is offered.
Page 138 Item 270

STOP WATER HAMMER . . . . . and control hydrostatic shock with Jay R. Smith's hydrostatic shock control. Designed to last the life of the piping system without failure, unit is available in six sizes. Booklet is available.
Page 139 Item 271

NON-SCALD SHOWER VALVE . . . . . from Symmons Engineering Co. is called America's favorite. Self-Cleaning action prevents clogging and saves water. Literature is available.
Page 140 Item 272

HOT WATER HEATER . . . . . of the automatic, commercial type is offered by Ewing Mfg. Co. It is called the low cost answer to the hot water problem for laundries, restaurants, motels, schools and apartments. Prices and details available.
Page 141 Item 273

LOW SILHOUETTE AIR MOVER . . . . . is offered by Greenheck Fan & Ventilator Corp. Low velocities. Weatherproof housing. No unsightly curb mountings. New catalog contains all details and specifications.
Page 141 Item 274

INDUSTRIAL FLOATS . . . . . from Arthur Harris & Co. are offered in copper, stainless steel, monel, steel, brass and aluminum. They are built for open or closed tank operation at low or high pressures and temperatures. Catalog is available.
Page 141 Item 275

A QUIET ANSWER . . . . . to noisy piping is the reinforced flexible rubber pipe sections manufactured by Vibration Mountings, Inc. Descriptive bulletin and vibration engineering data book are offered.
Page 142 Item 276

COOL THINKING, COOL FUN . . . . . are offered in Marquette University's air conditioned Brooks Memorial Union through use of equipment from The Vilter Mfg. Co. Literature is available.
Page 144 Item 277

AIR MOVING EQUIPMENT . . . . . from Clarage Fan Co was selected for Texas' new Southland Center because of its record for performing quietly, economically, and dependably. Information is offered.
Inside Back Cover Item 278

HUMIDITY-TEMPERATURE STATS . . . . . called Comfostats, outperform ordinary thermostats because they measure and control in relation to both temperature and humidity. Information is available from the manufacturer, Johnson Service Company.
Back Cover Item 279

CIRCLE FOR NEW EQUIPMENT AND LITERATURE INQUIRIES

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88
89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110

CIRCLE FOR AD-DIGEST INQUIRIES

200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221
222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243
244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265
266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287
288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309

PLEASE PRINT CLEARLY

Name .....

Title or Job Function .....

Firm .....

Nature of Firm's Business .....

Street .....

City .....Zone ....State .....

TO ORDER BOOKS DESCRIBED BELOW

Please send and bill me for the books circled: December '59

A B C D E F G H I J K L M N O P Q R S T U V

This service is not available to overseas readers. Cards are void after March 1, 1960.

FIRST CLASS
PERMIT NO. 53
NEW YORK, N. Y.

BUSINESS REPLY MAIL
NO POSTAGE NECESSARY IF MAILED IN UNITED STATES

POSTAGE WILL BE PAID BY

AIR CONDITIONING, HEATING and VENTILATING
93 WORTH STREET
NEW YORK 13, N. Y.

READERS SERVICE DEPT.

BOOKS TO HELP YOU WITH YOUR DESIGN PROBLEMS

DESIGN OF AIR CONDITIONING SYSTEMS

by F. W. Hutchinson

115 full-page charts solve problems of air conditioning system design involving cooling load, duct design, psychrometrics, solar energy, comfort conditioning, panel cooling, etc. For each chart the engineering and mathematical background plus design example and solution are given. **336 Pages, 118 Illus., $7.00.**

TO ORDER CIRCLE **B** ON CARD ABOVE

DESIGN OF HEATING AND VENTILATING SYSTEMS by F. W. Hutchinson

96 full-page charts solve problems of heating and ventilating involving load determination, duct design, panel heating, solar heating and combustion analysis. Companion book to Design of Air Conditioning Systems. Same methods to explain and solve problems are used. **320 Pages, 96 Charts, $7.00.**

TO ORDER CIRCLE **C** ON CARD ABOVE

COMBINATION OFFER

Both of the above books by Prof. F. W. Hutchinson, $12.50.

TO ORDER CIRCLE **D** ON CARD ABOVE

IT'S EASY TO GET THE BOOKS YOU NEED

Just circle the appropriate letters on one of the cards above and drop it in the mail. We'll ship the books and bill you. Or you can save book postage if you send payment with your order. Either way, you have full return privileges if not satisfied.

HANDBOOK OF AIR CONDITIONING, HEATING AND VENTILATING

Edited by Clifford Strock

Completely new book containing thousands of facts, figures, data and principles; hundreds of charts, tables and maps. Answers problems you face every day in your work. Subjects treated thoroughly include: Air Conditioning, Air Handling, Building Heat Loss, Climatic Data, Combustion, Degree-Days, Dual Duct Design, Dust Collection, Fuel Estimating, High Velocity Air, Mathematics, Motors, Piping and Plumbing, Psychrometry, Radiator Heating, Refrigerants, Service Hot Water, Solar Data, Steam Flow, Ventilation, Warm Air Heating, Terminology and a complete cross index. **1094 Pages, 7¾" x 10¾", 598 Charts, Maps, Illus., 518 Tables, $15.00.**

TO ORDER CIRCLE **L** ON CARD ABOVE

SUMMER AIR CONDITIONING

by S. Konzo, J. R. Carroll and H. D. Baraither

Training text and reference book on residential air conditioning for all who design, sell, install or operate these systems. Diagrams show mechanisms and principles of operation. Information understandable to beginner. Tells *how* and *why* things are done the way they are and *what* makes equipment operate the way it does. **560 Pages, 266 Illus., $8.00.**

TO ORDER CIRCLE **T** ON CARD ABOVE

WINTER AIR CONDITIONING

by S. Konzo, J. R. Carroll and H. D. Baraither

Does for heating what *Summer Air Conditioning* does for cooling. **640 Pages, 317 Illus., $8.00.**

TO ORDER CIRCLE **U** ON CARD ABOVE

COMBINATION OFFER

Both of the above Air Conditioning books, $15.00.

TO ORDER CIRCLE **V** ON CARD ABOVE

MORE BOOKS LISTED ON OTHER SIDE→

FIRST CLASS
PERMIT NO. 53
NEW YORK, N. Y.

This service is not available to overseas readers. Cards are void after March 1, 1960.

BUSINESS REPLY MAIL
NO POSTAGE NECESSARY IF MAILED IN UNITED STATES

POSTAGE WILL BE PAID BY

AIR CONDITIONING, HEATING and VENTILATING
93 WORTH STREET
NEW YORK 13, N. Y.

READERS SERVICE DEPT.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88
89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110
200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221
222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243
244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265
266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287
288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309

CIRCLE FOR NEW EQUIPMENT AND LITERATURE INQUIRIES

CIRCLE FOR AD-DIGEST INQUIRIES

Name .....

Title or Job Function .....

Firm .....

Nature of Firm's Business .....

Street .....

City .....Zone ....State .....

PLEASE PRINT CLEARLY

Please send and bill me for the books circled: December '59

A B C D E F G H I J K L M N O P Q R S T U V

TO ORDER BOOKS DESCRIBED BELOW

USE CONVENIENT CARD ABOVE TO ORDER THESE BOOKS

HIGH TEMPERATURE WATER SYSTEMS
by Owen S. Lieberg

A complete and concise exposition of the principles, design, installation and application of high temperature water. Written by the designer of many of the world's largest systems. For engineers, operators, and owners. **224 Pages, 109 Illus., $6.50**

TO ORDER CIRCLE M ON CARD ABOVE

METHODS OF JOINING PIPE by J. E. York

The most detailed information available on standards and special joints for all types of metallic, glass, tile, plastic and concrete pipe. Data on joints designed to take up movement due to expansion and contraction. **236 Pages, 249 Illus., $4.00.**

TO ORDER CIRCLE O ON CARD ABOVE

DESIGN OF INDUSTRIAL EXHAUST SYSTEMS
Completely revised 3rd Edition
by John L. Alden

This classic text on how to design, build and buy industrial exhaust systems has been brought up-to-date to meet modern standards of industrial environment. Developments and advances in devices and techniques described. **256 Pages, 137 Illus., $6.00.**

TO ORDER CIRCLE E ON CARD ABOVE

DESIGN OF PLUMBING AND DRAINAGE SYSTEMS by L. Blondermann

Detailed, illustrated guide covering modern plumbing practice and design. Basic problems as well as modern specialized topics are discussed. **328 Pages, 201 Illus., $7.00.**

TO ORDER CIRCLE F ON CARD ABOVE

FLUID FLOW IN PIPES by C. H. McClain

How to solve problems involving the flow of liquids and gases through pipes. How to handle viscosity, friction, heat, and other factors expressed in various dimensional systems. Worked-out problems show applications of principles. **124 Pages, 18 Illus., $4.00.**

TO ORDER CIRCLE J ON CARD ABOVE

PLANT AND PROCESS VENTILATION
by W. C. L. Hemeon

Design factors and data that can be applied to any situation. Principles are clear, logical. Shows how to estimate exhaust requirements for dust and fume producing processes, hot or cold. Principles of general ventilation and bulk materials handling. **448 Pages, 172 Illus., $9.00.**

TO ORDER CIRCLE Q ON CARD ABOVE

INDUSTRIAL HEAT TRANSFER
by F. W. Hutchinson

Provides 123 time-saving working graphs for the direct solution of most commonly encountered problems. Graphs are equal in accuracy to the equations from which they are derived and help eliminate errors in calculation. **336 Pages, 136 Charts and Illus., $7.00.**

TO ORDER CIRCLE N ON CARD ABOVE

SNOW MELTING by T. Napier Adlam

Correct, tested steps in planning, designing, building and operating snow melting systems. Time saving charts, tables and graphs give data and simplify every step. **224 Pages, 189 Illus., $4.50.**

TO ORDER CIRCLE S ON CARD ABOVE

FLOW AND FAN by C. H. Berry

Covers the *flow* of gas through ducts, and *fan* performance and control; moving air through ducts, fan selection and control, duct arrangement, system characteristics, flow analysis. Basic data and methods used to calculate system resistance. Practical information for selecting a fan for any duty. **232 Pages, 84 Illus., $4.00.**

TO ORDER CIRCLE I ON CARD ABOVE

OWNERS:
Southland Life Insurance Co.

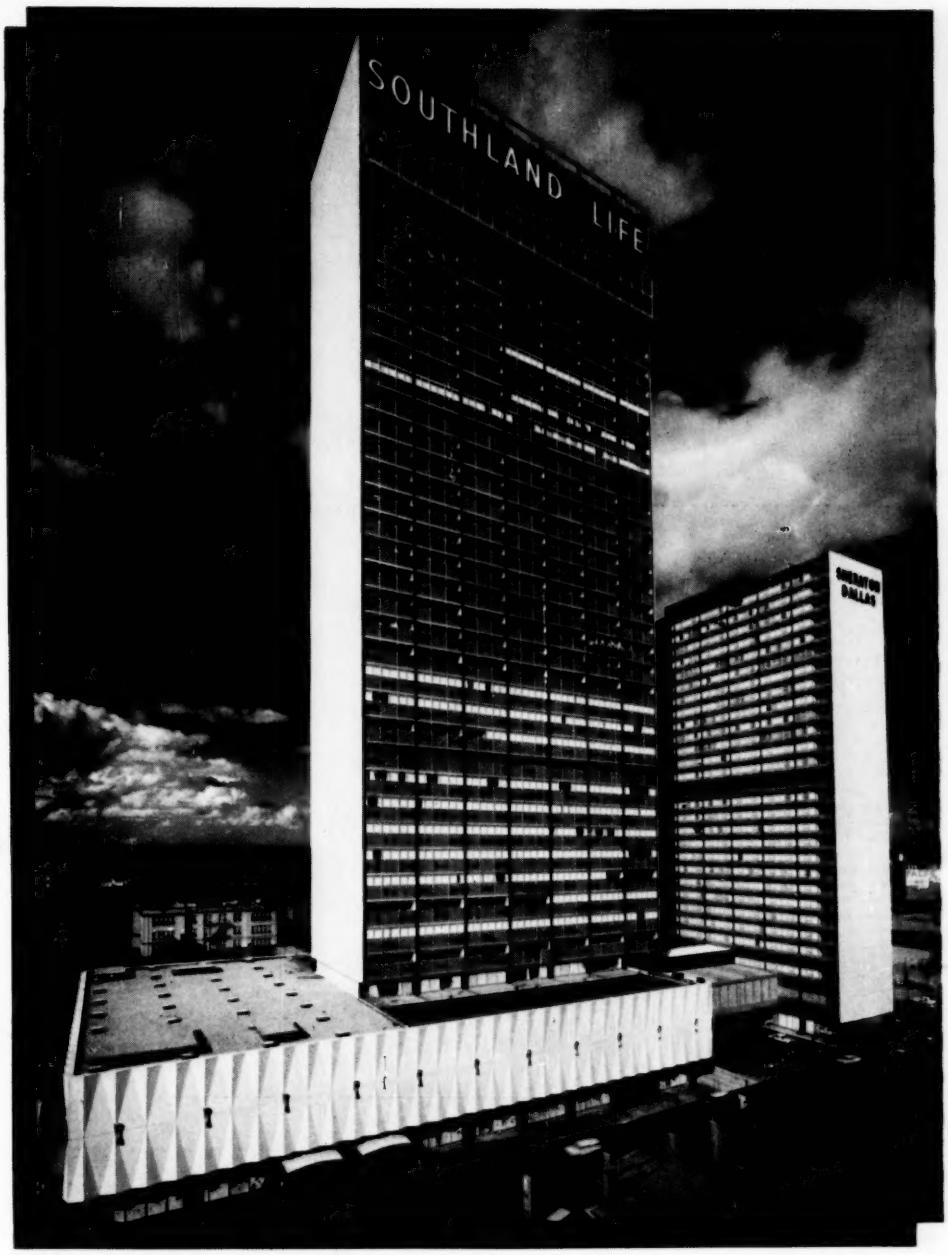
ARCHITECTS AND ENGINEERS:
Welton Becket & Associates, FAIA

CONSULTING ARCHITECT:
Mark Lemmon

CONSULTING MECHANICAL ENGINEERS:
Zumwalt & Vinther

GENERAL CONTRACTOR:
J. W. Bateson Co., Inc.

MECHANICAL CONTRACTOR:
Farwell-Wallace Joint Venturers



THIS TEXAS GIANT

. . . draws its breath from CLARAGE equipment

Standing tall on the Dallas skyline is the new Southland Center . . . a 42-story office tower and the connecting 29-story, 600-room Sheraton-Dallas Hotel. Here, as in so many other impressive structures, Clarage equipment is in use — 86 Type NH system fans, 4 Ready Unit ventilating sets, 6 Unitherm fan units. Prompting the selection: Clarage's record for performing quietly, economically, *dependably* Investigate the *quality* line we manufacture for buildings of all types.

Dependable equipment for making air your servant

CLARAGE FAN COMPANY

Kalamazoo, Michigan

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal

Johnson Comfostats give your clients new dimensions of comfort

outperform ordinary thermostats because they measure and control in relation to both temperature and humidity!

The U. S. Weather Bureau's recently published *Temperature-Humidity Index* has made your clients aware as never before of the effect on comfort of both temperature and humidity.

Johnson *Comfostats* are designed to control according to this *Temperature-Humidity Index,* regulating temperature in proportion to humidity changes. Since comfort at any given temperature varies according to the relative humidity, this humidity-compensated instrument meets modern comfort demands with greater accuracy than ordinary room thermostats, which control the dry bulb temperature only.

Comfostats, an exclusive Johnson development, are available in room, *Dual* room, insertion, and submaster models with a wide choice of operating features, including adjustable sensitivity to humidity changes.

Be sure to investigate the unique advantages of the *Comfostat.* Call your local Johnson representative or write: Johnson Service Company, Milwaukee 1, Wisconsin. 105 Direct Branch Offices.

JOHNSON CONTROL

PNEUMATIC SYSTEMS

DESIGN • MANUFACTURE • INSTALLATION • SINCE 1885

TEMPERATURE & AIR-CONDITIONING CONTROL SYSTEMS FOR COMMERCIAL, INDUSTRIAL & PUBLIC BUILDINGS–AND SHIPS